Metals Review
THE NEWS DIGEST MAGAZINE

Volume XXIII · No. 5 May, 1950

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***By** Carl A. Zapffe, Consulting Metallurgist*

This book is written to provide both to present users and to potential users of stainless steel a relatively primary and easy-reading account of the field —an account which may err occasionally from exactitude of detail in its effort to convey important generalizations. The reader to whom the text is addressed is supposed to have only a smattering of metallurgy but a real interest in educating himself in this field regardless of his background. With no background whatsoever, he can still read with some gain Chapter I on history, Chapters IV, V, and VI on physical and mechanical properties, and possibly Chapter VII on general instructions for fabricating. In Chapters II and III, the more technically trained reader can go further to gain fundamental chemical and metallurgical understanding of these steels, which will fit him for a broad understanding of the whole field.

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Metals Review

THE NEWS DIGEST MAGAZINE

RAY T. BAYLESS, Publishing Director — MARJORIE R. HYSLOP, Editor — GEORGE H. LOUGHNER, Production Manager

VOLUME XXIII, No. 5 — MAY, 1950

A. S. M. REVIEW OF METAL LITERATURE

New Classification System

Starting in 1950, a new classification system has been adopted for the ASM Review of Metal Literature. It is based on the ASM-SLA Classification of Metallurgical Literature, described in the February issue of* Metals Review. *Below are the titles of the main sections of the classification, together with the page numbers in this issue. The scope of each of these sections was explained in the classification outline published in February.

IMPORTANT LECTURES

DEPARTMENTS

Published monthly by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio; Arthur E. Focke, President; Walter E. Jominy, Vice-President; William H. Eisenman, Secretary; Ralph L. Wilson, Treasurer; Thomas G. Digges, Elmer Gammeter, Fred J. Robbins, Harry P. Croft, Trustees; Harold K. Work, Past President. Subscriptions $5.00 per year ($6.00 foreign). Single copies $1.00. Entered as Second Class Matter, July 26, 1930, at the Post Office at Cleveland, Ohio, under the Act of March 3, 1879.

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AT LAST! A Comprehensive METALLURGICAL INDEX

for Librarians · Engineers · Metallurgists · Researchers

WHAT IT IS:

The ASM-SLA Metallurgical Literature Classification is a subdivided outline of the entire science of metallurgy that provides a guide to the filing and indexing of metallurgical literature and data collections. It can be used with standard card indexing and literature filing systems or with a specially designed punched-card system. The complete classification outline and instructions for its use are contained in a handy 8½x11 paper-bound booklet, selling for a dollar (see coupon at left, below).

WHO MADE IT:

The classification was prepared by a joint committee of the American Society for Metals and the Special Libraries Association. Its authority, accuracy and completeness have been checked by experts in all branches of metallurgy.

WHO USES IT:

Librarians and metallurgists alike will find it invaluable for filing and indexing collections of clippings, papers, reports, notes and data; when used with the punched-card system it provides a labor-saving new tool for the researcher.

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For further details, see *Metals Review,* February 1950, page 4, and *Metal Progress,* May 1950, page 613.

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Annual A.B.C. Conference Held at Birmingham

Reported by Sam F. Carter
American Cast Iron Pipe Co.

The fourth annual "A.B.C. Conference" of the three Southern Chapters of A.S.M.—Georgia (Atlanta), Birmingham and Chattanooga—was held in March with the Birmingham Chapter as host. The program included plant visits to six different plants in the Birmingham district, an executive committee luncheon, and a dinner and technical program in the evening.

The subject of the technical program was "The Metallurgy of Stainless Steels", presented by R. H. Aborn, assistant director of research, U. S. Steel Corp. Although the improving effect of chromium on the corrosion resistance of iron was discovered as early as 1820, the basic discoveries of stainless steels came almost a century later, and their wide application was not begun until about 1930. The production of stainless steel has increased ninefold in the last 15 years, while total steel production has only doubled. Current annual production is better than 600,000 tons of ingots.

Chromium is the indispensable element for corrosion resistance of stainless steels. However, it closes the austenitic field whereas nickel enlarges the austenitic field, so the combination produces unique alloys. A number of typical compositions were discussed and classified into three general types: chrominum-base quench-hardening or martensitic steels; chromium-base non-quench-hardening ferritic steels; and Cr-Ni-base austenitic steels.

Two of the principal metallurgical problems are intergranular corrosion and sigma phase. Intergranular corrosion is thought to be caused by depletion of chromium from metal near the grain boundaries by the formation of intergranular carbides. Susceptibility decreases as the carbon is decreased. Such corrosion can be prevented by stabilizing the carbides with columbium or titanium, by reducing the carbon sufficiently, or by special treatment.

Sigma phase is a brittle compound of iron and chromium which can be very detrimental to toughness when formed under certain conditions at elevated temperature. An austenite lean in alloy is the best insurance against this constituent, which, however, can be removed by a suitable heat treatment.

Since the corrosion resistance of stainless steels depends upon a continuing supply of oxygen for the chromium in solid solution, these steels offer best resistance in oxidizing environments and poor resistance to strongly reducing acids and chlorides. Some of the most recent developments in the metallurgy of these steels are ultra-low carbon content (below 0.03%) made possible by the use of oxygen in refining, and precipitation-hardening types developed for applications requiring both corrosion and wear resistance.

The Annual A.B.C. Conference of Three Southern Chapters Was Held at Birmingham in March. In the photograph are (from left): Charles S. Chisolm, chairman of the Chattanooga Chapter; J. Ernest Hill, acting chairman of the Birmingham Chapter; R. H. Aborn, who spoke on stainless steel; and D. L. Hollowell, chairman of the Georgia (Atlanta) Chapter

The largest fields of applications are automotive trim, light-weight trains, aircraft engines, food and beverage processing, and chemical industries. Some recent novel applications are in television tubes and costume jewelry.

President Focke Gets Cook's Tour in New Mex.

Reported by Clyde R. Tipton, Jr.
Physical Metallurgist
Los Alamos Scientific Laboratory

The March meeting of the Los Alamos Chapter A.S.M. took the form of National President's Night with members and their wives attending a dinner honoring Dr. and Mrs. A. E. Focke.

For Dr. Focke, however, his three-day visit to the Los Alamos Chapter turned out to be something of a "Cook's Tour". Upon arrival in Albuquerque on March 19, he was whisked away to a meeting of persons residing in Albuquerque who are interested in establishing either a branch of the Los Alamos Chapter or an independent A.S.M. chapter. Highlight of this gathering was the talk which Dr. Focke gave explaining the aims and objectives of A.S.M.

On Monday afternoon, March 20, Dr. Focke reviewed with the local executive committee the chapter's operations and gave valuable suggestions regarding ways and means of increasing A.S.M. service to the community and chapter.

At the regular chapter meeting on Monday evening, Dr. Focke gave both the coffee talk and the lecture. The coffee talk was an informal presentation of A.S.M. affairs designed to acquaint both the members and their wives with activities and status of the national A.S.M.

Dr. Focke's technical lecture on the "Tempering of Steel" served to reacquaint the members with the more conventional aspects of metallurgy—something that occasionally is overlooked by many members, as a result of their unusual activities at Los Alamos.

On Tuesday morning Dr. and Mrs. Focke made a "flying" trip to the New Mexico School of Mines at Socorro. Dr. Focke addressed the student body and staff of the school and experiment station on the subject of "The Metallurgist and His Job". After luncheon at the school, the Fockes returned to Albuquerque and departed Tuesday afternoon for the remainder of Dr. Focke's western tour.

New Chapter Organized In Northern Ontario

Formation of a new local chapter of the American Society for Metals has been announced, to be known as the Northern Ontario Chapter, with headquarters in Sault Ste. Marie, Ont. The new chapter is the seventh local group to be organized in Canada.

Under the temporary organization, acting officers are W. C. Kimball, chairman; W. G. Davey, secretary; and C. L. McVicker, treasurer—all of Algoma Steel Corp.

The chapter, which has a total of 85 members, held its first meeting on April 27, when the charter was presented to the group by National President Arthur E. Focke.

Ceramics Seen as Possible Solution to High Heat Problem

Reported by Sayre S. Williams
Mechanical Engineer
U. S. Navy Electronics Laboratory

A resume of present and future developments in the ceramics field was presented to the San Diego Chapter A.S.M. at a recent meeting by John V. Long, assistant director of research, Solar Aircraft Co. Mr. Long stated that coated metals and plain ceramics are being studied with the hope of finding some satisfactory substitute for critical refractory metals.

J. V. Long

Ceramic coating on metals allows design to be based on the high-temperature strength and creep rate of the metal rather than on its oxidation or corrosion rates. With the extremely high temperatures involved in rocket motors, plain or solid ceramics have been tried, but have not yet proven entirely satisfactory.

Besides oxidation resistance, ceramic-coated metals possess other useful properties, such as dampening of vibration, reduction of fatigue failures, and low emissivity, the latter making possible low-emission coatings in the form of paint for exhaust systems.

According to Mr. Long, the greatest hope for increased temperature applications lies in the use of ceramics or combinations of ceramics and metals. Greater ductility and thermal shock resistance are needed before the problem can be solved, however.

Consulting Practice Announced

The formation of Ramseyer & Miller, Inc., consulting engineers, 11 West 42nd St., New York City, has been announced by Charles F. Ramseyer, chemical engineer and metallurgist, and J. R. Miller, electrical and civil engineer. The firm will engage in general engineering practice, with emphasis on heavy industry, particularly iron and steel.

Both men have been associated with H. A. Brassert & Co. for the past six years. They have recently returned from a 35,000-mile tour around the world, visiting Australia, Malaya, India, Pakistan, Israel, Italy, Switzerland, France and Holland.

Recording Dramatizes Career in Metallurgy

A 30-min. recording entitled "Your Career in Metallurgy" has been released by the American Society for Metals. Produced as one of the projects of the society's Advisory Committee on Metallurgical Education, the subject is presented in the form of a dialogue, complete with authentic sound effects and skillful radio techniques.

The recording is intended to clarify metallurgy in the minds of students who wish an engineering career, but have not decided upon the particular branch they will enter. The opportunities offered by a metallurgical career and its widespread influence on our daily lives are presented in a dramatic and swift-moving series of facts.

The ½-hr. program is currently being presented before many college freshman classes and high school senior students. Further information is available from the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

The Reviewing Stand

BOASTING membership in the "metalworking industry's basic scientific organization" for over 26 years, E. F. Houghton & Co. has published a "salute" to the American Society for Metals in the April issue of *The Houghton Line,* the company's house organ. The article traces the origin and growth of the society and tells of the benefits that have resulted to its members and to industry. Quoting from the introduction: "During the quarter-century just past, the metalworking industry has had phenomenal growth, from the standpoint of both technology and production, and we at Houghton give merited credit to the American Society for Metals for its widespread dissemination of vital technical information which has contributed so much toward this growth."

At this point the American Society for Metals would do well to turn about and give credit to the Houghton Co. and like organizations for their part in building the society to its present level. Some vital statistics on the Houghton organization constitute an illuminating example of such cooperation.

In addition to the 26-year sustaining membership in the Philadelphia Chapter, the company carries seven sustaining memberships in other communities. Such sustaining memberships help supply the financial lifeblood of the local chapters. Individual memberships among Houghton men total 58 in the United States and five in Canada. The company encourages these members to take part in the local chapter activities, to volunteer for organizational work, and to present technical talks when requested.

Houghton's vice-president, George W. Pressell, set a notable precedent for such activities by serving as a founder member of the Philadelphia Chapter. Mr. Pressell conducted the original membership campaign, and during the intervening 26 years has had the satisfaction of seeing the membership grow to its present total of 853, ranking among the five largest A.S.M. groups in the country.

The list of Houghton men who have served as chapter chairmen and secretaries is an imposing tribute to the caliber of personnel employed by the company. The list (taken from *The Houghton Line*) is as follows:

Chairmen (Present and Past)

A. J. Andre, Rockford, Ill. (Tri-City Chapter)
John Bermingham, San Francisco (Golden Gate)
W. A. Buechner, Pittsburgh
L. S. Colby, Columbus, Ohio
C. L. Elgert, Baltimore, Md.
G. W. Esau, Buffalo, N. Y.
Ed Hudson, San Francisco (Golden Gate Chapter)
O. R. Kerst, Worcester, Mass.
C. H. Lloyd, Grand Rapids, Mich. (West Michigan)
E. H. MacInnis, Toronto (Ontario Chapter)
L. B. Morrell, Kansas City, Mo.
R. H. Patch, Philadelphia
G. W. Pressell, Philadelphia
D. J. Richards, Pittsburgh
C. H. Stonerod, Springfield, Mass.
Glenn Thiersch, Peoria, Ill.

Secretaries

A. P. Fischer, Cincinnati, Ohio
H. J. Fletcher, Indianapolis, Ind.
C. R. Jackson, Seattle, Wash. (Puget Sound Chapter)

Scarcity of Jet Engine Materials Spurs Research

Reported by W. O. Manuel
AC Spark Plug Div., G.M.C.

"The scarcity of critical materials for jet engine parts is one of the major problems facing America's future in turbine engine manufacture", declared K. M. Bartlett, director of research at Thompson Products, Inc., speaking before the Saginaw Valley Chapter A.S.M. on March 21. The present material requirements for turbine engine parts are such that most of the major alloying constituents such as cobalt, columbium and nickel have to be imported from foreign countries. Thus, any interference which would curtail our sources of supply would tend to jeopardize our whole jet engine manufacturing program.

Jet engine manufacturers are also endeavoring to reduce the cost of materials, obtain greater temperature tolerance, and reduce the weight. The efforts being expended on this four-point program are exemplified by the fact that several million dollars was spent on material research last year.

Compressor blades which were previously made of Type 403 stainless steel by precision forging are now made by a powder metallurgy process developed by Thompson Products. The new process has resulted in increased production, ease in maintaining critical tolerances, and a saving in alloying elements.

The parts are pressed out of iron powder made from refined and reduced mill scale, sintered, coined to obtain trailing edge, and put through a hydrogen atmosphere furnace in conjunction with a copper alloy slug which fills the pores by capillary action. The parts are then heat treated with a resulting tensile strength of 100,000 psi. Finally they are recoined and given a chromizing treatment which provides a corrosion resistant surface containing 60% chromium.

In the jet engine, the temperature of the combusted gases entering the nozzles and striking the buckets of of the turbine wheel is 1550° F. Materials used for wheel buckets at present consist of alloys containing large amounts of cobalt and columbium. Because of the strategic nature of these elements, extensive research work has been conducted for the past two years on substitution of molybdenum. Molybdenum has the excellent conductivity and low expansion properties which are needed in these parts, but has the disadvantage of oxidizing very readily. Use of inert coatings to prevent oxidation is being investigated.

Mr. Bartlett spoke of the possibilities offered by ceramics or cemented intermetallics such as titanium carbides. They are inert to oxidation but are extremely brittle, and are therefore difficult to fabricate with current bucket-to-wheel attachment design.

England's design of jet engines was far in advance of anything we had until a few years ago. Our advancement since then has been rapid and our present designs are now comparable with theirs.

The meeting was designated as "Sustaining Members Night". Members of the Saginaw Valley Chapter of the American Society of Tool Engineers were invited as guests of A.S.M. for this program.

Sauveur Award Candidates Sought

Candidates for the 1951 Sauveur Award of the American Society for Metals are now being considered by the committee in charge of making the selection. This committee consists of the past presidents of the society, with Harold K. Work, immediate past president, serving as chairman.

According to the rules governing selection of the candidate: "The chairman shall canvass the executive committees of local chapters for written endorsements. He shall also request through appropriate publications of the society endorsements from individual members for nominations. Endorsements of a local executive committee shall be restricted to members of its local chapter.

"The chairman shall have investigations made by suitable subcommittees of the endorsements and nominations received. . . . Written reports of the investigating subcommittee shall be sent to each member [of the main committee] not less than 60 days prior to the annual meeting."

The final selection of the candidate is made by the committee, meeting in session during the annual convention of the society. If, in the opinion of the committee, none of the proposed candidates merits the award, no award is made.

The purpose of the Albert Sauveur Achievement Award is "to recognize a pioneering metallurgical achievement which has stimulated other organized work along similar lines to such an extent that a marked basic advance has been made in metallurgical knowledge. . . . This medal shall be given only after the pioneering work has been proven by time to have conformed to the purposes for which the award is made."

A.S.M. members are invited to submit to the committee the names and qualifications of any member considered eligible to receive the award. Such suggestions should be sent to Dr. H. K. Work, College of Engineering, New York University, University Heights, New York 53, N. Y.

THIRTY YEARS AGO

T. D. LYNCH of Westinghouse Electric & Mfg. Co. (later a past president of A.S.M., now deceased) presented a paper before the Pittsburgh Section of the Steel Treating Research Society entitled "Notes on the Heat Treatment of Steel".

—30—

Another name on the roster of early authors is E. G. MAHIN, professor at Purdue University, writing on "Effect of Nonmetallic Inclusions Upon the Properties of Steel and Iron". Professor Mahin, a past national trustee of A.S.M., has recently retired after many years as head of the department of metallurgical engineering at University of Notre Dame.

—30—

A note in the chapter news section calls attention to the fact that LESTER LANNING of New Departure Co. was "recently married (1919), yet has succeeded in attending every meeting of the society since!"

—30—

An article entitled "Atomic Metallurgy" might be construed as marking an early trend away from a preoccupation with the blacksmith art of heat treating toward the scientific aspects of metallurgy. The article represents an attempt to relate atomic architecture to composition and heat treatment of high speed steels, but apparently "atomic metallurgy" needed an understanding of "atomic energy" as a prerequisite.

—30—

Letter ballot for amalgamation of the two societies—the Steel Treating Research Society and the American Steel Treaters Society—was first announced in the January 1920 issues of the *Proceedings* and the *Journal*. Col. A. E. WHITE, professor of chemical engineering, University of Michigan, was the tactful and diplomatic chairman of the committee which drew up plans that proved highly acceptable to both organizations. The new name, American Society for Steel Treating, was proposed for the amalgamation.

—30—

C. U. SCOTT, president of C. U. Scott & Son (now octogenarian "dean of American heat treaters") was the first chairman of the Tri-City Chapter, embracing Davenport, Rock Island and Moline, Ill.

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The second meeting of the new Tri-City Chapter was addressed by CLAUD S. GORDON, then and now president of Claud S. Gordon Co., Chicago. His subject was "Fuel Economy".

Steel Industry Faced by Metallurgical and Economic Problems

Reported by D. B. Graves
Federated Metals Division
American Smelting and Refining Co.

In order to have a sound economy and assist in the recovery of war-torn Europe it is necessary to keep American industry strong, stated R. E. Zimmerman, vice-president of United States Steel Corp., in speaking to the Calumet Chapter A.S.M. on Feb. 14. Dr. Zimmerman's subject was "Metallurgical and Economic Problems of the Steel Industry".

Some of the interpretations on economic problems by labor and government officials have been difficult to understand; for instance, these agencies held that an increase in wages would cause inflation while pensions and social benefits supported by industry would not. Dr. Zimmerman pointed out that this is about the same reasoning that a metallurgist might use if he discovered that heat treating a steel part at 1830° F. for 15 min. was unsatisfactory, but concluded it would be all right to heat treat it at 1000° C. for a quarter of an hour.

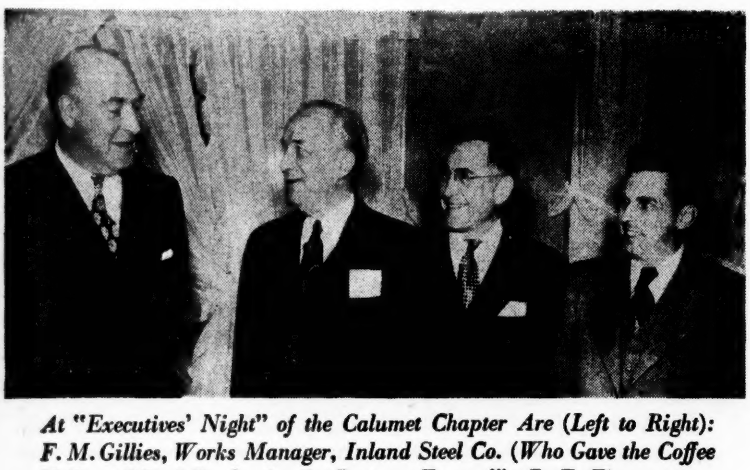
There are few technological problems that do not involve economics, the speaker continued. Some of the large problems facing the steel industry today are *(a)* new sources of supply of high-grade low-cost ore, *(b)* the coal supply, *(c)* control of industrial wastes, and *(d)* social benefits and pension plans.

Dr. Zimmerman remarked that the steel industry is in need of new sources of high-grade raw materials. Although there is plenty of ore at the present time, it is necessary to look into the future. Extensive planning, research, exploration, testing, and development of new sources of supply are being carried out throughout the world and such operations require a great deal of money. The beneficiation of low-grade ores is also a problem because no one method suffices for all low-grade ores, nor does one type of mill to treat them.

Strikes and slowdowns have affected the coal supply. Likewise, the sulphur content of the coal is rising, and this introduces new trouble in the smelting and refining operations. The development of beneficiation processes for coal is being investigated to control the sulphur content.

Regulations exist in many communities to control the pollution of the air and streams of industrial waste. Several technical and economic problems need to be solved to comply with these ordinances, Dr. Zimmerman indicated. Investigation has shown that much of the air and stream pollution is caused by home heating plants and city sewage disposal.

Finally, social benefits and pension plans are placing a heavy financial burden on industry. Much wisdom and foresight are needed to adopt plans that will be a benefit to society.



At "Executives' Night" of the Calumet Chapter Are (Left to Right): F. M. Gillies, Works Manager, Inland Steel Co. (Who Gave the Coffee Talk on "Steel Production in Postwar Europe"); R. E. Zimmerman, Vice-President of U.S. Steel Corp. (Who Presented the Main Lecture on "Metallurgical and Economic Problems of the Steel Industry"); D. R. Cornell, Vice-President of Standard Forgings Corp. (Technical Chairman); and H. B. Wishart, Chief Division Metallurgist, Carnegie-Illinois Steel Corp. (Vice-Chairman of the Calumet Chapter)

New Developments in Materials Traced At Detroit Sustaining Members Night

Reported by Malcolm G. Simons
Pressed Metals of America, Inc.

The 68 sustaining members of the Detroit Chapter A.S.M. were honored on March 13 at the regular monthly meeting of the chapter. Membership certificates were also presented to the six newest members.

Principal speaker of the evening was T. C. DuMond, editor of *Materials & Methods*, who had chosen as his subject "New Developments in Materials Engineering".

Among these new developments Mr. DuMond mentioned two new stainless steels — namely, the precipitation-hardening stainless steels, which can be cold worked and then age hardened at 900° F., and the new low-carbon stainless steels.

Very rapid rates of machining are now being obtained from the new leaded high-machinability steels, Mr. DuMond said. He also discussed the advantages of machining highly alloyed materials by raising their temperature to 1000 or 1500° F. during the operation.

New developments in the production and use of titanium and zirconium and their alloys were not overlooked. In the field of processing and fabricating, a buffed and polished surface can now be obtained by chemical polishing. This works well with nonferrous metals and is expected to be perfected for ferrous metals soon. Other new developments listed included hot and cold extrusion of metals, bright carbonitriding of steel, gas-shielded arc welding with argon and helium, and wheel bearings made from nylon.

T. C. DuMond

Coffee talker immediately following the dinner was Carl Goelz, picture editor of the Detroit *News*. In place of a prepared talk, he invited questions, criticism, and comment from the members present relating to newspapers and newspaper policy.

Control Instruments Play Important Role In Metal Processing

Reported by A. H. Boehm

Chief Engineer
Steel Co. of Canada, Ltd.

Modern control instruments play an important role in ferrous metal processes, from the melting and refining operations, through to the heat treatment and also in the power plant, Wayne L. Besselman of Leeds & Northrup Co. proved in a paper presented before the Montreal Chapter A.S.M. on March 6.

An important phase of blast-furnace instrumentation is the automatic control of hot blast temperature, Mr. Besselman explained. As the stoves which supply hot air to the blast furnace cool down, the cold air flow is progressively reduced until a point is reached where changeover takes place automatically to another preheated stove, while the exhausted stove is returned to gas. In addition, the temperatures of the stoves and downcomer are recorded, as well as the stock position and movement.

In the openhearth, automatic controls are used to reverse the flow of air through the checker chambers at the appropriate time, and at a preset temperature difference. Roof temperature of the openhearth is controlled by Rayotubes to protect the refractory of the roof from overheating. The Immersion Rayotube enables the openhearth operator to obtain accurate temperature measurements of molten metal at any time during the heat. Such measurements are of great value for quality control.

Mr. Besselman then went on to explain in detail how automatic controls are utilized in soaking pits and other reheat furnaces, in bloom and slab mills, in wire patenting, sheet annealing, and malleableizing of castings.

In the field of heat treatment, a recent development is the application of steam as a protective atmosphere, particularly for the treatment of high speed steel cutting tools. When heating such parts to 1050° F. for about ½ hr. in an air-free steam atmosphere, a thin layer of iron oxide is formed, which greatly increases the useful life of such tools. A steam atmosphere is also used in the clean annealing of brass and copper.

In nitriding and carburizing furnaces, the rate and depth of case formation is a function of atmosphere potential, time and temperature. All of these require careful control throughout the whole process.

In the power plant, modern combustion control of boilers is indispensable for the economic operation of large units. Leeds & Northrup has developed the Metermax system, which measures the flow of fuel, primary and secondary air, and balances these against the steam header pressure; adjustments are automatically made to maintain the desired combustion condition.

Two films were also shown during this meeting, through the courtesy of the Aluminum Co. of Canada. The first, on "Heat Treatment of Aluminum Alloys", demonstrated the structural changes which take place in aluminum during heat treatment. The second, entitled "Bubble Model of a Metal", was made by the Cavendish Laboratories in England. It illustrated how molecular changes which take place in metals when exposed to external forces can be demonstrated through the medium of fine soap bubbles floating on a liquid surface.

Natural Reversion of Metals to Oxides, Salts Depletes Ore Resources

Reported by R. A. Grange

U. S. Steel Research Laboratories

The immense cost of corrosion and what can be done about it was forcibly brought home to the members of the New Jersey Chapter A.S.M. by R. M. Burns, chemical director, Bell Telephone Laboratories, speaking before the March meeting.

The tendency of metal to revert by corrosion to oxides and salts involves annually an appreciable loss in natural resources. For example, it has been estimated that, in an average year, 10% of the iron recovered annually from its ore is lost through corrosion of iron and steel products. When maintenance and replacement costs are included, the annual expenditure traceable to corrosion is approximately 5.5 billion dollars.

Corrosion may be prevented—or at least greatly reduced—by inducing a noncorrosive environment or, more commonly, by providing a protective film on metal surfaces. In certain metals and alloys, a protective film develops naturally on exposure to air; often the protective film is improved greatly by dipping in chemical solutions, such as chromate bath.

A satisfactory protective film, whether metallic or nonmetallic, must be nonporous and adherent; in addition, it is desirable that it be self-healing and reasonably tough. Suitable tests have been developed to reveal these qualities.

Electroplating is a common method for producing a corrosion-resistant, as well as an attractive, coating. Nickel, tin, chromium and zinc are used in large quantities and cadmium in smaller quantities for plating iron and steel. Plating techniques are continually being improved; a recent example is the periodic reversal of plating current to promote a smoother coating.

Hot-dip coatings of zinc, tin or lead are used extensively. A zinc coating is improved, particularly where condensation of moisture occurs, by a chromate dip; this effectively prevents the so-called "white bloom". The relatively new methods of coating iron and steel with aluminum appear to have a great future.

The mechanism of corrosion depends upon the corrosive environment. The common "tin can" is an excellent example of the complex nature of protection afforded by a thin film of tin under the special conditions inside a sealed can. Mr. Burns described a newly discovered type of corrosion of zinc in which microscopic filaments, or "whiskers", form.

A large variety of nonmetallic coatings, especially paints and lacquers, are available and new ones are continually being introduced. Improvements have also been made recently in methods of applying such coatings.

Although corrosion was a recognized problem early in history, few advancements in methods for combating corrosion were made until rather recently. Mr. Burns believes that new coatings and methods of application will be developed at an accelerated pace in the immediate future.

Washington Has Ladies' Night

Reported by M. R. Meyerson

National Bureau of Standards

Washington Chapter held "Ladies' Night" on March 16, and celebrated the occasion with the showing of five movies. Titles were, "Bridging San Francisco Bay", "Steel—Man's Servant", "Treasure From the Sea", "Wilderness Canoe Country", and "The Fighting Lady". After viewing the films, the capacity audience was served refreshments.

7th Biennial Interchapter Meeting at Penn State

On June 16 and 17 the seven chapters of the American Society for Metals that are located wholly or partly in Pennsylvania will hold their Seventh Biennial Pennsylvania Interchapter Meeting at State College, Pa., under the auspices of the Penn State Chapter.

The technical program will feature an address by Cyril Stanley Smith on "The Microstructure of Metals". There will be two sessions on Friday afternoon, June 16, one on heat treating and the other on the formability of metals. On Saturday morning the discussions on formability will be continued, and there will also be a session on gases in metals. Papers by outstanding experts will be presented at each session, but there will be ample time for discussion.

An informal banquet and entertainment on Friday night will highlight the nontechnical part of the program. Provisions are being made for a ladies' program for both days of the meeting.

Urges Continued Air Force Research

Brig. Gen. F. R. Dent, Jr., of the U.S. Air Force (Center), Was the Principal Speaker at "Young Fellows' Night" of the Pittsburgh Chapter. At left is Chapter Chairman G. A. Roberts, and at right is H. B. Myers, a member of the committee in charge of the special program

Reported by R. M. Allen
Carnegie-Illinois Steel Corp.

The urgent need for continued supremacy in technical development of air equipment was convincingly established by the opening remarks of Brigadier General Fred R. Dent, Jr., of the U. S. Air Force, at the March 9th meeting of the Pittsburgh Chapter A.S.M. General Dent emphasized that the United States still is uncertain as to what is going on behind the Iron Curtain.

The assurance of an atomic explosion and the development of improved air equipment in Russia display ample evidence that they possess the latest atomic and mechanical information. Ultimate concern, however, resolves into a realization that the United States has no sure defense against atomic warfare, which is in itself sufficient incentive to accelerate our efforts to retain technical supremacy.

The recent trend is toward selective research for optimum components of weapons of the future, and toward developing facilities for such research concurrent with a minimum of expenditure. Aircraft selectivity is based on speed, weight and carrying power; facilities should be flexible for remodeling and refining; and development and design should aim toward high-temperature equipment, higher speeds, and higher altitudes, utilizing the lightest structures capable of withstanding bending and torsional strain.

General Dent revealed that research of the past ten years has developed a magnesium alloy as a capable substitute for aluminum. Magnesium alloys, which are lighter and more abundant than aluminum, possess adequate strength, but low ductility and poor notch sensitivity had to be overcome. The magnesium alloy known as FS-1h has proved satisfactory. Recently, the possibilities of titanium are being studied because of its resistance to creep at high temperature and because of weight saving — approximately 40%, when used in place of stainless steel, gage for gage.

Modern air equipment has undergone radical changes in appearance and propulsion features. Design trends are currently toward sandwich structures, which are lighter in weight but still exhibit high strength and good torsional-rigidity properties. The use of strong noncorrosive adhesive bonds to replace riveting and spot welding has been highly successful. Methods to perfect rolling of tapered sheet and extrusion of tapered wall parts are being further investigated. Availability of low-carbon and low-alloy steels for missiles is being considered, and a comprehensive study of ceramic-coated steels for higher operating temperatures and better heat distribution is being expanded.

Chattanooga Sponsors Lectures on Toolsteels

A three-day educational series on toolsteels was sponsored by the Chattanooga Chapter A.S.M. on March 13, 14, and 15. Total attendance was 75 men; 12 companies were represented, and 38 men received certificates for attendance at all three meetings.

John A. Koch, regional manager of the Carpenter Steel Co. in Cincinnati, served as instructor. The course was aimed at shop level, with the purpose of providing answers to daily problems encountered in practical operation. Mr. Koch effectively covered such subjects as proper selection of toolsteels, relation of design of tools to heat treatment, heat treatment operations, trouble shooting, and other related problems.

The course was open without charge to anyone interested.

Calumet Ladies Hear About Freezers

Members of the Calumet Chapter A.S.M. Entertained Their Wives at the Annual Ladies' Night Meeting on March 14. At the speakers' table (left to right) are Mrs. J. R. Bateman; Mrs. L. O. Braun; Mr. L. O. Braun, sales manager, home freezer division, Deepfreeze Appliance Division, Motor Products Corp.; J. R. Bateman, technical chairman; E. W. Taylor, chapter chairman; W. J. Holliday, Jr., advertising manager, W. J. Holliday and Co.; Mrs. E. W. Taylor; Mrs. A. J. Scheid; Mr. A. J. Scheid, chapter secretary. Mr. Bateman spoke on "The Impact of the Freezer and Its Effect on the Eating Habits of the American Family", and Mr. Holliday presented colored movies taken on a safari through Kenya Colony in British East Africa. Refrigerator trays were presented to the ladies as favors. (Reported by D. B. Graves)

Notched-Bar Test Will Forecast Service Failures

Speaking on "Significance of Testing as Related to Specifications" before the Louisville Chapter A.S.M. on March 7, G. C. Riegel, chief metallurgist of Caterpillar Tractor Co., questioned the usefulness of some tests as a means of preventing failures.

When the first Liberty ship broke up in the frigid North Atlantic, the tons of tension test specimens which had been made from the plates of which the ship was constructed proved to be of little significance. The hull of the ship was separated by a sudden crack which started at some sharp re-entrant angle. A simpler and less costly test—the notched-bar test—could have been used to study the brittle transition temperature of the steel, and the ships could have been saved, Mr. Riegel claimed.

Engineers cannot use foot-pounds, Charpy or Izod values, in design, but these tests are often the key to the behavior characteristics of steel when under constraint due to notches, and operating at low temperatures.

The abnormal behavior of some typical machine components was examined by the speaker. Leaf springs may fail in two ways—by the sudden snap when the springs receive an impact load (especially if spring clips are loose) and by the progressive or fatigue failure. The prevention of failures involves proper composition, satisfactory surface qualities, and correct hardenability.

Because of the tendency of high-silicon steels to pick up phosphorus from the furnace slag during teeming, the composition of leaf springs has been changed from S.A.E. 9262 to S.A.E. 8660. This reversion of phosphorus could lower the Charpy values from 10 to 4 ft-lb. at a breaking tempreature of −20° F. and at a hardness level of Rockwell C-45. Localized stresses originating at surface discontinuities are often the cause of spring failures, and the S.A.E. 9262 steel possesses little ability to redistribute these localized stresses. Decarburized surfaces; small transverse cracks in the surface resulting from rolling, straightening, or heat treating; nicks; and slivers are all offenders, serving as "stress raisers".

The ability of bolts and capscrews to stay together and function as fasteners is often thought of in terms of the conventional tension test for ductile material. But what are the failures observed in service? Heads are snapped off, or the typical "oyster-shell" pattern of the progressive failure appears. Obviously, the material should be strong enough but it needs more than strength!

Often the initial cracks started at some weakness, a sharp tool mark, a decarburized surface, a lap, or a seam. Proper fillets and maximum radii at the root of the threads are also necessary to eliminate failures. The toughness of the material itself can best be measured by the sharp-notched Izod specimen.

Mr. Riegel stated that he did not want to place undue emphasis on one type of mechanical test but wanted to show the best approach to significant tests. The problem of devising suitable tests in place of the ultimate test (the use test) is difficult and may never be solved to everyone's satisfaction.

Metallurgical Principles Reduce "Art" of Grinding to Science

Reported by S. A. Minton, Jr.

Allison Div., G.M.C.

Closer cooperation between the metallurgist and the tool engineer in solving grinding problems has been apparent in recent years, according to L. P. Tarasov, metallurgical engineer, Norton Co. Research Laboratories. Dr. Tarasov spoke before the Indianapolis Chapter A.S.M. on March 20 on "Some Metallurgical Aspects of Grinding". A concentrated effort is being made to reduce the "art" of grinding to a science through the application of metallurgical principles, he said.

Although grinding is often considered similar to milling, it differs in that the grinding wheel must wear at a controlled rate if it is to work satisfactorily. If wheel wear is too great, wheel contours cannot be properly held, and if the wheel wears only slightly, the abrasive grains do not fracture and present new sharp-cornered facets for good cutting action. The material being ground determines the amount of wheel wear.

The wheel wear obtained under some standard set of grinding conditions can be used to measure the "grindability" of various materials. Grindability is a special form of machinability, and may be defined as the relative ease of removing metal by grinding. For toolsteels, it has been determined that wheel wear increases with the hardness of carbides in the steel being ground.

The remainder of the talk was devoted to a discussion of various grinding difficulties. Grinding cracks are shallow and run perpendicular to the grinding direction; in a severe form, they join to form a network. Cracks result when too much heat is generated in the surface for the sensitivity of the steel.

In the grinding of high speed toolsteel, double tempering has reduced such cracking substantially, by transforming retained austenite in the first drawing operation and tempering it in the second draw rather than through the heat of grinding. Retained austenite in submicroscopic amounts has also caused occasional cracking in certain lots of S.A.E. 52100 steel. Carburized steels are extremely sensitive when a cementite network is present at the surface of the case.

Burning of the work may or may not be harmful depending upon its severity and position in regard to the service of the part. Even though the discoloration which accompanies burning may have been removed, burned spots can be detected on the part nondestructively by a special etching procedure. Hardness of burned spots may be greater or less than nonaffected areas, depending on whether the heat supplied was enough to transform the area to martensite, or merely to overtemper the area involved.

The metallurgist can help on grinding problems by setting up standards on allowable burn, and by requiring maximum as well as minimum hardness limits on hardened steel parts that are to be ground. These measures, plus reduction of heat treat distortion to a minimum, uniform machining previous to grinding, and selection of proper wheel type, dressing, feed and speed, and grinding fluid, will go far toward increasing production rates in grinding.

Takes Position in West Va.

After approximately eight years with C. I. Hayes, Inc., as sales engineer, J. M. Hines has resigned to take up new duties as sales engineer with the C. I. Thornberg Co., Huntington, West Va. The company handles metering and control equipment, and chemical proportioning devices. Mr. Hines has been serving as publicity chairman and *Metals Review* reporter for the Rhode Island Chapter A.S.M. during the 1949-50 season.

Foley Is Sauveur Lecturer

Reported by E. K. Spring

Chief Metallurgist
Henry Disston & Sons Co.

"Factors Affecting Deformation of Metals at Elevated Temperatures" was the subject of the Sauveur Memorial Lecture at the Philadelphia Chapter meeting on March 31. The author and speaker presenting the paper was Francis B. Foley, former national president of A.S.M. and a past chairman of the Philadelphia Chapter. The choice of the speaker stemmed from the recognition that he was imbued by many of the ideals held by the one whose memory has been honored in dedicating one evening each year to him.

The coffee talk was presented by Guy Marriner of the Franklin Institute and University of Pennsylvania music departments. A pianist of note, he rendered several selections on the piano, introduced by descriptive remarks on the lives of the composers and significance of the music.

Rome Has Forum on Wire and Cable

Participants in Rome Chapter's Panel Discussion on Manufacture of Electrical Wires and Cables Were: (Standing) Gustav V. Pirk (Left), and Rudolph A. Schatzel, Both of Rome Cable Corp.; (Seated, From Left) John L. Hawes, Revere Copper and Brass, Inc.; Carl G. Moser, Utica Steam Engine and Boiler Works; and Harry W. Howard, Rome Cable Corp. (Photo Courtesy of Rome Daily Sentinel)

Reported by L. H. Decker
Revere Copper and Brass, Inc.

Five local members of the Rome Chapter A.S.M. participated in a panel discussion on "Manufacture of Electrical Wires and Cables" at the regular meeting on March 13. Rudolph A. Schatzel, vice-president in charge of engineering for Rome Cable Corp., served as moderator.

Gustav V. Pirk, chief metallurgist at Rome Cable, opened the program with a discussion of "Copper and Preliminary Fabrication". Dealing with oxygen-bearing coppers and oxygen-free high-conductivity coppers primarily, Mr. Pirk emphasized the characteristics of each and discussed casting, heating, hot rolling and pickling.

Some of the finer points in the cold rolling and drawing of copper wire were then covered by John L. Hawes of Revere Copper and Brass, Inc. The basic factor involved in making wire from various copper alloys, he pointed out, is that machines, dies and lubricants must all be designed in such a way as to work together for optimum results.

Various methods used in finishing wire were mentioned by Carl G. Moser, service engineer for Utica Steam Engine and Boiler Works, with emphasis on rubber-covered wire fabricated by extrusion or hydraulic methods. Types of equipment were discussed, and Mr. Moser also explained the process of covering wire with lead.

The formal program was concluded with a description of the history and development of various types of insulation used as covering material, presented by Harry W. Howard, assistant director, Rome Cable Corp. Members of the audience then participated in open discussion of the points covered.

Mr. Schatzel was introduced as moderator by W. B. Van Ornam, General Cable Corp., the program chairman for the evening.

Rolls May Weigh up to 77 Tons, Utilize Wide Range of Steels & Irons

Reported by J. G. Cutton
Metallurgist
Carnegie-Illinois Steel Corp.

The subject of roll manufacture dates back to 1725, and yet today far more of the world's metal is shaped by rolls than by any other tool, F. H. Allison told the Mahoning Valley Chapter meeting on March 14. Dr. Allison, who is chief metallurgist of United Engineering and Foundry Co., spoke on "Roll Manufacture and Application". He was introduced by Karl L. Fetters, special metallurgical engineer, Youngstown Sheet and Tube Co. (see photograph below).

Rolls may vary in weight, and some are now made as heavy as 77 tons, the speaker said. Rolls have a very special and tough job to do, for they must withstand abrasion, excessive surface stresses, sliding friction, and expansion and contraction forces.

In the process of making rolls from both cast steels and cast iron, control and care are necessary to produce a roll with soundness, correct analysis and proper heat treatment so as to give maximum service. Of special interest was Dr. Allison's description of the double-poured rolls for high speed cold mills. These rolls are of composite metal with a hard, wear resistant surface and tough core and neck.

In conclusion, Dr. Allison pointed out that in United's foundry there are over 72 possible grades of steel rolls with varying carbon and alloy contents. In the iron foundry the roll variation is infinite, not only by virtue of variation in alloy content but also by variable adjustment of chill depth and graining. Constant research is in progress to develop better rolls to give longer and more satisfactory service.

Describes Roll Manufacture

F. H. Allison (Center), Chief Metallurgist, United Engineering and Foundry Co., Spoke on "Roll Manufacture and Applications" Before the March Meeting of the Mahoning Valley Chapter. At left is Walter Jenkins of United Engineering and Foundry Co., and at right is Karl F. Fetters, technical chairman of the program. (Photograph by Henry Holberson)

Present High-Temperature Symposium

A Panel of Five Authorities Who Presented a Symposium on "High-Temperature Metallurgy" Before the Eastern New York Chapter Consisted of (From Left): Gilbert Hanke, Gunther Mohling (Chairman of the Program), and W. W. Dyrkacz, All of Allegheny Ludlum Steel Corp.; and J. D. Nisbet, George Heckman, and G. B. Wilkes, Jr., All of General Electric Co.

Reported by Alexander Lesnewich
Rensselaer Polytechnic Institute

A Symposium on "High-Temperature Metallurgy" was presented to the members of the Eastern New York Chapter A.S.M. at their February meeting. A panel of five authorities gave 15-min. lectures which covered the forging, precision casting, testing, design, and applications of high-temperature alloys.

Gunther Mohling of Allegheny Ludlum Steel Corp. served as chairman of the program. Most alloys for use at temperatures ranging from 1200 to 1600° F. have come into prominence during the past ten years, he pointed out, although the stellites have been known for many years.

W. W. Dyrkacz, also of Allegheny Ludlum, divided his discussion of "Forging of High-Temperature Alloys" into two epochs. The first, from 1940 to 1945, was a period characterized by metallurgical and quality control; the second, from 1945 to the present, might be considered as the cost reduction period. Rotating parts subjected to high fatigue stresses perform better if forged (due to uniformity of properties), but the obvious difficulty of plastically deforming a material which is designed to resist deformation at high temperatures poses a cost reduction problem.

This led to the "Precision Casting of High-Temperature Alloys", as presented by Gilbert Hanke of Allegheny Ludlum. The investment process now being used should be economically cheaper, but process control must become more exact to reduce the product variations now experienced. Because of this, the lost-wax process is used only for nonwearing parts in the medium-temperature range.

Selection of the proper alloy for a given application is logically based on data derived from "High-Temperature Testing", as discussed by Gordon B. Wilkes, Jr., of General Electric Co. Mr. Wilkes included the rupture, creep, relaxation, fatigue and damping tests, described the methods of testing and demonstrated the usefulness of the data.

The question, "Can High-Temperature Alloys Be Designed?", was answered by James D. Nisbet of General Electric Co. Mr. Nisbet defined the high-temperature region as that above the temperature at which flow occurs by slip and rotation of grains and where fracture occurs along grain boundaries. Therefore, the "high temperature" is determined by the metal or alloy itself. These alloys *can* be designed, since the contributions of various alloying additions can be predicted within reason.

Uses of these materials were illustrated by George Heckman of General Electric Co. in his subject: "Applications in Stationary Gas Turbines". In addition to the other properties mentioned, Mr. Heckman considers corrosion resistance, stability, machinability, availability and cost of an alloy as important in its selection for a particular function.

New Names Added to Quarter Century Club

The following A.S.M. members have been awarded honorary certificates commemorating 25 years' consecutive membership in the society:

Eastern New York Chapter—F. P. Coffin, William E. Ruder, James Taylor.

Hartford Chapter—G. R. Brophy, W. P. Eddy, Jr., R. M. Keeney, C. H. Sweet.

Indianapolis Chapter—Clarence H. Beach, W. Chapin, Arthur E. Focke, Carl F. Lauenstein, G. A. Wainwright, Carl J. Winkler.

Muncie Chapter—F. M. Crapo, Wilbur W. Patrick.

Pittsburgh Chapter—R. K. Bowden.

St. Louis Chapter—Walter C. Joern. Sustaining memberships: Laclede Steel Co. (W. M. Akin, representative), Western Cartridge Co. (Alvyn Arnold, representative).

Educational Lecturers Receive Desk Pens

Lecturers in the 1950 Educational Series of the Indianapolis Chapter A.S.M. Were Presented With Desk Pen Sets at the Regular March Meeting. Left to right they are George Sommer, Elmer Zink, Gene Davis, George Shubat (all lecturers) and John Watson, chapter chairman. Two additional lecturers not shown in the picture are Carl Sundberg and Jack Newsom

Reported by S. A. Minton, Jr.
Allison Div., G.M.C.

A fundamental course on "Heat Treatment of Steels" was recently completed by the Indianapolis Chapter A.S.M., under the direction of Carl Sundberg, chairman of the Educational Committee. "Principles of Heat Treatment" by Marcus A. Grossmann was used as the text; cost of the course was limited to the price of this book.

Popularity of the subject was attested by the average attendance of 150 for the five lectures; those with 100 per cent attendance were presented with attendance certificates.

Die Steels Play Important Role in Die-Casting Process

(See photo on opposite page)

Reported by H. O. Nordquist

Manager, Alloy & Stainless Steel Dept. Joseph T. Ryerson & Son, Inc.

Inasmuch as much of the responsibility for the development and economical operation of the die-casting process rests upon the steel dies used, this material plays an important role in the manufacture of die casting, stated J. C. Fox, chief metallurgist of the Doehler-Jarvis Corp., speaking before the St. Louis Chapter A.S.M. on "Die-Casting Steels" on March 17. The control of variables of the die-casting process, of die temperatures, pressures, and shot speed is facilitating the production of sounder and more uniform die castings, he said. Such practice has resulted in the use of die casting for applications which previously were not considered practicable.

Likewise the constantly increasing size of die castings is forcing the construction of larger die-casting machines to handle the larger parts. Problems relating to die design and die construction, as well as problems concerning nonferrous and steel metallurgy and casting technique, multiply as the size of the die castings increases.

The die steels are especially important in die casting the higher melting metals and alloys. Die-casting dies are of necessity expensive and the thousands of dollars expended in fabricating them must be justified by good, serviceable life as measured in terms of production of an adequate number of castings.

To obtain economical life on any die, the steel used in fabricating it must be of a suitable composition and must be prepared under the best possible steel mill conditions. Other factors, such as die design, heat treatment and the care and handling of the die in production, also are important, and errors in these factors can result in uneconomical die life even with the best type and quality of steel.

Mr. Fox enumerated nine characteristics required for the die steels to operate successfully, as follows:

1. Structural soundness and uniformity.
2. Good machinability.
3. High resistance to heat checking.
4. Sufficient strength and hardness to resist deformation in service.
5. Sufficient toughness to resist cleavage cracking.
6. High resistance to the erosive and washing action of the die-casting alloy.
7. High thermal conductivity.
8. Low coefficient of thermal expansion.
9. Dimensional stability in heat treatment.

Quality control of die steels is imperative if good results are to be expected. It is paramount that steel be purchased under a rigid set of specifications drawn up by the metallurgical department. The steels should be inspected on receipt by macro-etch examination, ultrasonic testing and in some cases by microscopic examination.

The various steel compositions for dies used in casting zinc, aluminum, magnesium and copper-base alloys were listed, together with appropriate heat treatments for these die steels. Recommendations for methods of minimizing distortion and warpage as well as for promoting long life were emphasized.

British Columbia Hears Focke on Wear Testing

Reported by Percy Bland

Chief Engineer
Canadian Sumner Iron Works, Ltd.

Highlight of the season's technical meetings for the British Columbia Chapter A.S.M. was President's Night on April 3, when National President Arthur Focke and Secretary Bill Eisenman made a visit to Vancouver. Dr. Focke presented the main address of the evening on "Wear and Wear Testing".

Following a question period, Frank Cazalet of the B.C. Executive Committee thanked the speaker and presented him with a pair of engraved gold cuff links in memory of his visit to Vancouver.

Bill Eisenman's talk on society affairs was most informative, particularly his data on a metallurgists' salary survey.

Nominations for new chapter officers were announced at the evening meeting, and it was learned with regret that the chapter's long-time secretary, Fred Stephens, would no longer be able to continue this work.

Martempering Explained

Reported by Wilhelm Olson

Atwood Vacuum Machine Co.

R. H. Aborn, associate director of U. S. Steel Research Laboratories, presented an enlightening discussion of some of the basic factors involved in the technique and practice of martempering steel before the Rockford Chapter meeting on Feb. 22. Much of the material was a result of an investigation reported in *Metal Progress* for January 1949.

While martempering as practiced in this locality is largely confined to toolsteels, Dr. Aborn's work points up the fact that it is applicable also to production alloys. Modifications of complete martempering were also discussed, particularly their effect on dimensional change.

Preceding Dr. Aborn's talk, Seth B. Atwood, president of the Atwood Vacuum Machine Co., and also of the local Park Commission, spoke to the Chapter about some interesting features and new developments in the local park system.

Foundry Control Is Greatest Problem In Nodular Iron

Reported by G. F. Kappelt

Chief Metallurgist, Bell Aircraft Corp.

How to produce a cast iron that is capable of being hot worked without the development of split edges was explained to the Buffalo Chapter A.S.M. at its February meeting. The Chapter was fortunate to have Charles O. Burgess, technical director, Gray Iron Founders' Society, present this technical talk on nodular cast iron.

According to Mr. Burgess, the greatest problem in producing good results with nodular cast iron is foundry control. Careful control is necessary to precipitate the graphite as nodular particles rather than flakes.

Magnesium is commonly used to produce these nodular graphite particles. It would appear that subsurface vaporization of magnesium occurs previous to its solution in iron. In order to accomplish this subsurface vaporization without explosive violence, the magnesium is usually added as an alloy, combined with nickel, copper, silicon, iron, or various combinations of these.

To the cast iron man, one of the most difficult conditions to meet is the limitation in permissible sulphur. For example, it is usually feasible to produce nodular iron from a base iron containing more than 0.10% sulphur. Even under such circumstances the sulphur content must be further decreased to around 0.02% by desulphurizing with materials such as sodium carbonate and magnesium itself. Low sulphur content is necessary because magnesium will continue to react with the sulphur in the iron until this low level is reached. This reaction removes magnesium that otherwise could perform its important role as a nodular particle producer.

According to Mr. Burgess, nodular cast iron can be made with tensile strengths ranging from 50,000 to 100,000 psi.; ductility ranges on the average from approximately 20% to 2%. Although nodular iron exhibits a ductility phenomenal for a high-carbon cast material, as with any new product it must be evaluated in terms of the properties required in a particular application. Mr. Burgess was careful to point out that if the high strength is required, namely (in the neighborhood of 100,000 psi.), the user cannot expect the high ductility values that are currently being quoted in the literature.

Carbide Phases Affect Heat Treatment and Properties of Toolsteel

Reported by R. M. DeVarney
The Stanley Works

Carbides play an important role in the heat treatment of high speed steel, as well as affecting the physical properties of the resulting toolsteel, George A. Roberts, chief metallurgist, Vanadium-Alloys Steel Co., demonstrated in an address at Seymour, Conn., on March 16. The occasion was the Past Chairmen's Night of the New Haven Chapter A.S.M.

Dr. Roberts pointed out that the carbide phase will increase after hardening, with relatively small increases of additional carbon. He also cited the relative amounts of carbide phase that will be found in various toolsteels with different combinations of alloys.

Three types of carbide phase and one intermetallic phase are to be found in the high speed toolsteels. These are M_6C combinations (iron, tungsten and molybdenum), the $M_{23}C_6$ combination (chromium carbides), the MC type (vanadium carbides), and the M_3R_2 phase, which provides no carbon for hardenability. All four types of phase carbide may be combined in the varying types of high speed steels to obtain certain desired properties.

Differences in hardness that exist among the different excess carbides are indicated by the following Knoop hardness figures: For iron carbide 1150, for chromium carbide 1820, for aluminum oxide 2440, and for vanadium carbide 2550.

Hardness of high speed steel may be varied over a relatively wide range by tempering, Dr. Roberts stated, without greatly affecting the impact strength; however, yield strength changes considerably with small variations in hardness brought about by tempering.

Metal Stampings Effect Economies

J. Walter Gulliksen, General Superintendent, Worcester Pressed Steel Co. (Center), Was the Principal Speaker Before the March Meeting of the Worcester Chapter. Left is Orum R. Kerst of E. F. Houghton & Co., chapter chairman, and right is Harold B. Bell, plant manager, Worcester Stamped Metal Co., who acted as technical chairman. Mr. Gulliksen is holding a magnesium propeller dome. (Photo by C. Weston Russell)

Development of the art of stamping and deep drawing from the early cane ferrules to the complicated products of today was outlined by J. Walter Gulliksen, general superintendent, Worcester Pressed Steel Co., speaking before the Worcester Chapter A.S.M. on March 8. Patents issued in 1868 and 1870 to J. H. Cole of Millbury, Mass., mark the beginning of the stamping industry, which has since grown to a position of tremendous industrial importance.

The theory of deep drawing was explained as a phenomenon of "plastic flow" in which the metal is stressed beyond the elastic limit but not beyond the ultimate strength. Thus the metal is caused to flow into the desired shape with a minimum of straining or stretching. This method was contrasted with forging, in which process the metal is beaten into shape, usually at elevated temperatures.

The selection of materials suitable for stampings was explained. A wide variety of both ferrous and nonferrous metals is available from which the stampings designer may choose.

A large number of actual stampings was displayed, including automotive parts, domestic appliances, cages for roller bearings, typewriter parts and a propeller dome drawn from ½-inch thick magnesium plate. With clever redesigning, castings, forgings, or machined parts can often be replaced with stamped parts, thus reducing both cost and weight of the products.

The art of impact extrusion was also explained and the advantages and disadvantages of this process were outlined as compared with conventional stamping methods.

Fox Speaks on Die-Casting Steels

Speakers' Table at the March Meeting of the St. Louis Chapter (Left to Right): Louis Malpoker, Chapter Chairman; J. E. Fox of the Doehler-Jarvis Corp., Speaker; L. E. Morrell, Secretary; and C. W. Messinger, Program Chairman. Mr. Fox's subject was "Die-Casting Steels"

Temperatures Involved in Jet Propulsion Present Unsolved Test Problems

Reported by A. D. Eplett
Chief Engineer
Manning, Maxwell & Moore, Inc.

How best to test materials for jet propulsion to give a definite and satisfactory indication of what they will do in service is not yet known, admitted Prof. N. J. Grant of Massachusetts Institute of Technology, addressing the New Haven Chapter A.S.M. on Feb. 16. In the range of temperatures involved in jet propulsion, an entirely different set of phenomena exists which are not comparable to those predictable by a knowledge of room-temperature metallurgy.

At room temperature, Dr. Grant explained, one can determine tensile properties in minutes, hours, or weeks; yield point and elongation can be definitely established, and fatigue tests will yield the usual S-N curve. In the high-temperature field, on the other hand, one particular aspect of the problem cannot be considered alone. Stress, for example, must always be related to temperature, strain rate, and service life.

The short-time elevated temperature tensile test gives only one point on a changing strength curve as a function of time, and hence the stress-to-rupture test is at variable times and at variable temperatures. Since it is a plastic reaction, there is no endurance limit, and a wide range of test data must be accumulated before one can do a satisfactory reasoning job. In turbine blades, the problem is further complicated by the fact that they are exposed to sulphur, lead, corrosive ash, and unburned carbon.

Aluminum alloys for compressor blading reach a limit at air temperatures of 500° F. or above—the temperature for compression ratios of about 3. When compression ratios get as high as 12 and the compressed air reaches 1000° F., heavier alloys and higher melting point alloys must be used. Titanium alloys look interesting for this application because of the metal's lower specific gravity and much better creep properties at about 1000° F. Much work is yet to be done in the field of damping and fatigue, probably through actual testing of titanium in compressor stands.

Dr. Grant then discussed the problem of materials for jet engine blades operating between 1350 and 1500° F. and combustion chambers with peak temperatures several hundred degrees hotter. Materials for this purpose should have a life of 100 to 500 hr., with stresses in the range of 12,000 to 20,000 psi. on the blades.

Grain size is an influencing factor, the speaker said, both in forgings and in precision castings. In general, coarse-grained material shows better stress-to-rupture data and fine-grained materials show better fatigue. Very large grains of proper orientation might be strong; on the other hand, poor orientation of grains might equally tend toward poor strength properties.

Future trends in the high-temperature field may be toward the utilization of titanium carbides and the ceramic-metal combinations along with molybdenum. A short discussion of the shortcomings of precision cast blades for jet engines concluded the presentation of this most timely subject.

Names Providence Distributor

The Riverside Metal Co. of Riverside, N. J., has appointed the Clifford Metal Sales Co. of Providence as a warehousing distributor in the Rhode Island area, where the company supplies quality copper-base alloys to the manufacturing jewelry trade. The new distributor will augment customer service provided by the company's Hartford office.

National Metal Congress and Exposition
Chicago—Oct. 23-27, 1950

Classroom Tour Through A Typical Steel Plant Illustrates Quality Control

Reported by Edward Rupert

Metallurgist, Allis-Chalmers Mfg. Co.

An impressive educational "classroom tour" conducted through a typical steel plant featuring "Quality Control in Steelmaking" formed the program for the March 21st meeting of the Milwaukee Chapter A.S.M. W. H. Mayo, staff head of process control at Carnegie-Illinois Steel Corp., conducted the "tour", which was supplemented by slides.

Mr. Mayo defined the term "quality" in a steel as the attribute that makes it suitable for the use intended, and the term "control" as the ability to reproduce steel uniformity. The pressure of competition in the early thirties led to increased quality control in steelmaking and the formation of observation corps to follow all steel processing. Quality of the steel is dependent upon the full cooperation and teamwork of all of the plant personnel.

Actually quality control begins with the arrival of a customer's order. The technical trade service metallurgist supplies the mill metallurgists—or more precisely the specifications unit—with supplementary information relating to the customer's requirements. From mill records the standard procedure is selected for proper steel processing. In the overall consideration this includes the control of raw materials; openhearth charging and deoxidation practice; proper pouring, soaking pit, and cropping practice; and final rolling to obtain the finished product.

Mr. Mayo related in detail the control steps on silicon and sulphur necessary to produce a quality product. Better control is obtained when using "in-plant" scrap than when using outside scrap; representative sampling of outside scrap is extremely difficult. Any addition of ferro-alloys is made from previously sampled supplies. The carbon and oxygen relationship in the bath and slag basicity are very important. Rapid carbon determination is made in low-carbon steels by the fracture test, while the carbometer can be used over a wide range of carbon steels.

The quality of the material desired is dependent upon the delivery time to the soaking pits, the transit time to the mills, and upon the final rolling temperatures. By using various statistical methods in analyzing functional relationships in steel processing, the cause of many troublesome problems can be determined. For example, the relationship of the cooling time after pouring and the following time in the soaking pit affects the quality of the product.

An excellent kodachrome tour of Europe was given by Wilson Trueblood of Leeds & Northrup Co.

IMPORTANT MEEINGS FOR JUNE

June 1-3—Electric Metal Makers Guild, Inc. 18th Annual Meeting, Shawnee Hotel, Springfield, Ohio. (R. J. McCurdy, secretary, E. M. M. G., Box 6026, Pittsburgh 11.)

June 8-10—National Society of Professional Engineers. Annual Meeting, Hotel Statler, Boston. (Alfred Abboud, chairman, publicity committee, N.S.P.E., c/o E. B. Badger & Sons Co., 75 Pitts St., Boston 14, Mass.)

June 12-15—American Electroplaters' Society. 37th Annual Convention; Fourth International Conference on Electrodeposition, in collaboration with the Electrodepositors' Technical Society of Great Britain, Hotel Statler, Boston. (A.E.S., 473 York Rd., Jenkintown, Pa.)

June 12-16—American Society of Mechanical Engineers. 4th National Materials Handling Exhibit, International Amphitheater, Chicago. (Ernest Hartford, executive assistant secretary, A.S.M.E., 29 West 39th St., New York 18.)

June 12-16—Special Libraries Association. Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. (Kathleen B. Stebbins, secretary, S.L.A., 31 East 10th St., New York 3.)

June 16-17—American Chemical Society, Division of Analytical Chemistry. Third Annual Summer Symposium, Ohio State University, Columbus, Ohio. (Alden H. Emery, secretary, A.C.S., 1155 16th St., N.W., Washington 6, D.C.)

June 19-21—American Chemical Society, Division of Physical and Inorganic Chemistry. Symposium on Anomalies in Reaction Kinetics, University of Minnesota, Minneapolis. (Alden H. Emery, secretary, A.C.S., 1155 16th St., N.W., Washington 6, D.C.)

June 19-23—American Society of Mechanical Engineers. Semi-Annual Meeting, Hotel Statler, St. Louis, Mo. (Ernest Hartford, executive assistant secretary, A.S.M.E., 29 West 39th St., New York 18.)

June 19-23—American Society for Engineering Education. Annual Convention, University of Washington, Seattle. (F. M. Dawson, chairman, Engineering College Research Council, A.S.E.E., c/o College of Engineering, State University of Iowa, Iowa City.)

June 26-30—American Society for Testing Materials. 53rd Annual Meeting; Ninth Exhibit of Testing Apparatus and Related Equipment, Chalfonte-Haddon Hall, Atlantic City, N. J. (R. J. Painter, A.S.T.M., 1916 Race St., Philadelphia 3.)

June 28-30—Heat Transfer and Fluid Mechanics Institute, Berkeley Campus, University of California.

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio

W. W. Howell, Technical Abstractor

Assisted by Pauline Curry, N. W. Baklanoff, Fred Rothfuss, and Leila M. Virtue

A GENERAL METALLURGICAL

106-A. Ship 70,991,490 Gross Tons Lake Superior Iron Ore in 1949. *Skillings' Mining Review,* v. 38, Mar. 25, 1950, p. 1-2.

Tabulation broken down by ranges, type of treatment, and individual mines. (A4, Fe)

107-A. Closing Research - Manufacturing Gap Brings About Major Production Economies. R. J. Emmert. *Steel,* v. 126, Mar. 27, 1950, p. 66-70, 94.

By applying scientific knowledge involving all phases of engineering, General Motors' process development section helps the company's various divisions to effect spectacular improvements in manufacturing efficiency. Cut-wire shot peening and shot blasting, welding nuts to sheet metal, tub method of polishing and buffing, and new painting techniques are a few of the projects which have paid off in lower costs.
(A5, G23, K13, L10, L26)

108-A. Control of Atmospheric Beryllium. Norman P. Pinto. *Metal Progress,* v. 57, Mar. 1950, p. 345-347, 382, 384, 386, 388, 390, 392.

Equipment and procedures for safeguarding health of workers engaged in processing of beryllium. (A7, Be)

109-A. Cutting Costs by Planning Tool Manufacture. George S. Clarke. *Iron Age,* v. 165, Mar. 30, 1950, p. 104-106.

Miscellaneous design and production tips, including weld repair. (A5, G general, T5)

110-A. Los Angeles Foundrymen Test Air Pollution. Control Equipment. T. L. Harsell, Jr. *Western Metals,* v. 8, Mar. 1950, p. 25-27.

Detailed analysis of methods and results. (A7, E general)

111-A. Repcal Brass Installs Unique Fume Control System. *Western Metals,* v. 8, Mar. 1950, p. 32-33.

Applied to brass-smelting furnaces. (A7, C21, Cu)

112-A. Air Pollution Control Equipment in Use in Western Plants. *Western Metals,* v. 8, Mar. 1950, p. 34-37.

Lists concerns selling dust and fume-abatement equipment to western metalworking industry. Brief descriptions of the equipment sold by each company. (A7)

113-A. Devalued Foreign Currencies Used as Trade Weapon to Undersell Metals Produced in U. S. Felix E. Wormser. *Metals,* v. 20, Mar. 1950, p. 6-7, 9-10.

Urges domestic mining industry to ask Congress for protection against unfair competition by foreign producers of lead and zinc. (A4, Pb, Zn)

114-A. ECA Activities Have Important Bearing on Mining Industry in Western Hemisphere. C. H. Burgess. *Metals,* v. 20, Mar. 1950, p. 12-13.

Agency's funds are used to buy 21,000 tons of copper, 8,000 tons of lead, 11,000 tons of zinc, and 13,500 tons of aluminum each month. Economic effects. (A4, Cu, Pb, Zn, Al)

115-A. Character of Waste Oil Emulsions. David Milne. *Sewage and Industrial Wastes,* v. 22, Mar. 1950, p. 326-330.

Some factors to be considered in the breakdown of emulsions from metal-cutting operations. (A8, G21)

116-A. Extended Use of Oil Emulsions To Minimize Disposal Problems. M. A. Pratt. *Sewage and Industrial Wastes,* v. 22, Mar. 1950, p. 331-335.

Reconditioning of grinding coolants in a central system. (A8, G21)

117-A. Research and Development; A Survey of the New Rubery Owen and Co., Ltd., Test Plant for Automotive Components. *Automobile Engineer,* v. 40, Mar. 1950, p. 87-92.

Research and testing facilities of new British plant. (A9)

118-A. British Steel; Some Post-War Developments. *Metallurgia,* v. 41, Feb. 1950, p. 181-190.

Developments in modernization, enlargement of facilities, and effective use of plants, for main producing areas. (A5, A4, ST)

119-A. Progress of the Aluminium Industry. Post-War Production Activities. *Metallurgia,* v. 41, Feb. 1950, p. 199-203.

General development of the industry in Britain. Describes major developments during the war and post-war extension schemes. (A4, Al)

120-A. Research on a New Cell for Recovery of Silver From the Electrolytic Bath by Regeneration of the Bath. (In Italian.) Luigi Fracchia. *Metallurgia Italiana,* v. 41, Nov.-Dec. 1949, p. 287-291.

Critically reviews existing methods. Proposes use of a new type of diaphragm cell. Method of operation, optimum conditions, and economical aspects of this method. (A8, L17, Ag)

121-A. Industrial Research Foundations. Haldon A. Leedy and Francis W. Godwin. *Physics Today,* v. 3, Apr. 1950, p. 14-19.

Details concerning the larger organizations of this type in the U.S. (A9)

122-A. Saving Money With Tool Salvage and Repair. Joseph Corney. *Production Engineering & Management,* v. 25, Apr. 1950, p. 51-53.

How Kaiser-Frazer uses tool salvage programs to cut production costs. Welding plays a leading role. (A8, K general, T6)

123-A. "Automation"—A Magic Word Which May Spell Lower Production Costs for You. A. H. Allen. *Steel,* v. 126, Apr. 3, 1950, p. 102-104, 106, 108.

Automation is defined as the automatic movement of parts between processing operations, synchronizing such movement with the production line. Tells how Ford saves up to 20% permitting equipment write-offs in 3 to 12 mo. by use of automation. (A5)

124-A. Automation in Forging and Heat Treating. Thomas E. Darnton and Willard L. Mantz. *Tool Engineer,* v. 24, Apr. 1950, p. C30-C31.

At Oldsmobile's forge plant. (A5, F22, J general, CN)

125-A. The Work of the Department of Engineering and Metallurgy, Ontario Research Foundation. O. W. Ellis, P. E. Cavanagh, and L. A. Usher. *Canadian Mining and Metallurgical Bulletin,* v. 43, Mar. 1950; *Transactions of the Canadian Institute of Mining and Metallurgy,* v. 53, 1950, p. 161-173.

Facilities and research programs. 12 ref. (A9)

126-A. European Research in Physical Metallurgy. B. D. Cullity. *Journal of Metals,* v. 188, Apr. 1950, p. 648-650.

A survey based on two years spent in Europe, the first in metallurgical research at the Ecole des Mines in Paris and the latter in scientific liaison for the London branch of the U. S. Navy's Office of Naval Research. Limited to Western Europe and to basic, rather than applied, research. (A9, N general)

127-A. Acid Conditioning of Metallurgical Smoke for Cottrell Precipitation. A. L. Labbe. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, Apr. 1950, p. 692-693.

Describes author's experience in operation of an early Cottrell installation which led to development of a sulfuric acid fuming furnace for auxiliary acid conditioning of combined Wedge-roaster and lead-sinter smoke. (A8, B15, Pb)

128-A. Small Steel Mills for Local Markets. H. W. McQuaid. *Iron Age,* v. 165, Apr. 6, 1950, p. 90-94.

Economic factors involved in erection of small plants in areas now remote from the mills. It is claimed that electric furnaces, making carbon bar and flat-rolled products, plus fast continuous mills, permit steel costs as low as those of large integrated plants. Selection of type of mill. (A4, D general, ST)

129-A. Current Research in Physical Metallurgy. Earl R. Parker. *Quarterly of the Colorado School of Mines,* v. 45, June 1950, p. 31-36; discussion, p. 36-38.

Differences between applied and basic metallurgical research. Outlines a number of unsolved problems in each field. (A9)

130-A. Development of Improved Metals to Determine Success of Atomic Energy Program. *Steel*, v. 126, Apr. 10, 1950, p. 91-92, 94, 97. Based on Seventh Semiannual Report, U. S. Atomic Energy Commission, Jan. 1950.

Strength of metals, diffusion in solid metals, thermodynamic research, corrosion, and effects of radiation are among AEC's basic research projects outlined. (A9)

131-A. The British Non-Ferrous Metals Research Association; Increased Laboratory Capacity. *Metallurgia*, v. 41, Mar. 1950, p. 263-266.
(A9, SG-a)

132-A. The Iron and Steel Industry in India. E. V. Parkinson. *Engineering*, v. 169, Mar. 17, 1950, p. 311-312; Mar. 24, p. 336-337. A condensation.
(A4, Fe, ST)

133-A. AISI—Progressive Spearhead of the Iron and Steel Industry. *Standardization*, v. 21, Apr. 1950, p. 90-92, 107.

Organization and activities of American Iron and Steel Institute. (A9, S22, Fe)

134-A. Steel Profits—Drop Little Despite Strike. *Iron Age*, v. 165, Apr. 13, 1950, p. 106 + insert.

Includes folded table giving financial analysis of the steel industry for 1948 and 1949. The data cover 26 companies representing 92% of U. S. ingot capacity. (A4, ST)

135-A. The Influence of Osmond on the Development of the Physical Metallurgy of Steel. G. B. Willey. *Sheet Metal Industries*, v. 27, Mar. 1950, p. 211-217, 220; Apr. 1950, p. 311-322.

Detailed analysis of the work of Floris Osmond and other metallurgical pioneers. 43 ref. (A2, ST)

136-A. Treatment of Waste Waters From the Pickling of Steel. G. E. Eden and G. A. Truesdale. *Journal of the Iron and Steel Institute*, v. 164, Mar. 1950, p. 281-284.

Experiments of Gehm on neutralization of dilute solutions of H_2SO_4 by application in upward flow to a bed of limestone grit were extended to show that the limiting concentration of acid that can be satisfactorily neutralized is dependent on temperature of solution. The method would have the advantage that large volumes of waste water could be treated in a comparatively small plant.
(A8, L12, ST)

137-A. (Book) Metallurgy. 60 pages. Colorado School of Mines, Department of Publications, Golden, Colo. *Quarterly* of the Colorado School of Mines, No. 3A, v. 45, June 1950. $0.50.

Papers presented at conference on metallurgy during the 75th Anniversary meetings on "Mineral Resources in World Affairs". Individual papers are abstracted separately.
(A9, B14, T28)

138-A. (Book) Disposal of Plating Room Wastes. B. F. Dodge and D. C. Reams. American Electroplaters' Society, Jenkintown, Pa. AES Research Report No. 14, 1950. 48 pages. $1.00.

Critical review is part of an investigation into the general field of plating room waste disposal. Many references. Includes the effects of cyanide wastes on streams and sewage treatment plants. (A8, L17)

139-A. (Book) Review of Current Research and Directory of Member Institutions. 186 pages. 1949. Engineering College Research Council, College of Engineering, State University of Iowa, Iowa City, Iowa. $1.75.

Over 4000 current college and university research projects in engineering subjects are listed by title. Entries from 82 educational institutions describe administrative policies for conducting engineering research and list responsible personnel, research expenditures, short courses, and conferences of special interest; also titles of all engineering research studies currently active at each institution. Includes a breakdown of research projects according to engineering departments involved, and a subject index. (A9)

140-A. (Book) Engineers' Dictionary, Spanish-English and English-Spanish. Ed. 2. Louis A. Robb. 664 pages. 1949. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16. $12.50.

Contains over 75,000 terms used in everyday practice by civil, mechanical, and electrical engineers—an increase of 70% over the previous edition. The modern vocabularies of mining, shipbuilding, logging, sugar milling, petroleum production, airport construction, metallurgy, radio, and chemistry are also included.
(A10)

B

RAW MATERIALS AND ORE PREPARATION

112-B. Iron Ore for Great Britain. H. U. Ross. *Canadian Mining Journal*, v. 71, Mar. 1950, p. 59-62.

Previously abstracted from *Mine and Quarry Engineering*. See item 100-B, 1950. (B10, Fe)

113-B. Leaching Process: Recovery of Manganese From Low-Grade Ores. Richard D. Hoak and James Coull. *Chemical Engineering Progress* (Engineering Section), v. 46, Mar. 1950, p. 158-162; discussion, p. 162.

See abstract from *Iron Age*, item 22-B, 1950. (B14, Mn)

114-B. Recent Developments in Research. V. L. Mattson. *Mines Magazine*, v. 40, Mar. 1950, p. 35-36, 56.

Heavy-media separation, carbide rock bits, fluidized-solid roasting and calcining, fluorocarbon compounds, cermets, silicones, new methods for metallurgical analysis, jet-piercing of rock, and new uses for gallium.
(B general)

115-B. Minerals' Debt to Man. John D. Sullivan. *Mines Magazine*, v. 40, Mar. 1950, p. 44, 60.

Need for proper timing in metallurgical developments, since expensive methods for recovery of low-grade ores cannot be applied until the high-grade ores become scarce. Belief that advances in prospecting and beneficiating methods will supply the minerals needs of the U. S. in the foreseeable future. (B10)

116-B. Refractories Developments. An International Review of Recent Work and Techniques. F. F. Cordwell. *Refractories Journal*, Feb. 1950, p. 30-35.
(B19)

117-B. Phase Rule Investigation of the System Al_2O_3-SO_3-H_2O at 60°, Basic Region. Jack L. Henry and G. Brooks King. *Journal of the American Chemical Society*, v. 72, Mar. 1950, p. 1282-1286.

Investigated during development of a combined H_2SO_4-H_2SO_3 leaching process for extraction of alumina from clay as an aid in elimination of such impurities as silica, titania, iron, and phosphorus. 20 ref.
(B14, Al)

118-B. Modern Foundry Methods: Briquetting Coke Breeze Cuts Melting Costs. *American Foundryman*, v. 17, Mar. 1950, p. 40-42.

Practice as applied by Pontiac Motor Div., General Motors Corp. (B18)

119-B. Investigation of Tungsten Metals Corp. Deposits (Minerva Mining District) White Pine County, Nev. E. W. Newman, Robert W. Geehan, and Russell R. Trengrove. *U. S. Bureau of Mines*, Report of Investigations 4648, Mar. 1950, 13 pages.

Includes flow sheet and description of milling methods.
(B10, B13, W)

120-B. Flotation. *Machinery Lloyd* (Overseas Edition), v. 22, Mar. 4, 1950, p. 79-81, 83.

Process, equipment, and applications. (B14)

121-B. The Thermodynamic Properties of Molybdenum and Tungsten Halides and the Use of These Metals as Refractories. L. Brewer, L. A. Bromley, P. W. Gilles, and N. L. Lofgren. "Chemistry and Metallurgy of Miscellaneous Materials — Thermodynamics," Ed. 1, 1950, p. 276-311.

High-temperature chemistry of the metals and their halides. Conditions for nonattack of the metals by halogens, hydrogen halides, and other halogen-producing compounds. Methods of preparing halides and their high-temperature properties. 10 ref. (B19, Mo, W, SG-h)

122-B. Crushing of Single Particles of Crystalline Quartz; Application of Slow Compression. John W. Axelson and Edgar L. Piret. *Industrial and Engineering Chemistry*, v. 42, Apr. 1950, p. 665-670.

Single particles weighing 1-2 g. were crushed in a steel mortar by means of slow compression. Energy input was calculated from force and displacement measurements. Surface areas of the original sample and of the crushed product were determined by gas adsorption. A relationship was found between new surface formed per unit of energy input and energy concentration at fracture. Efficiency of crushing single particles ranged from 1.7 to 26.5%. This compares with 1.4% for multiple particles. Hypotheses are advanced to explain the results. 16 ref. (B13)

123-B. Magnetic Separation of Minerals. Sven Eketorp. *Canadian Metals*, v. 13, Mar. 1950, p. 6-9, 46-47.
25 ref. (B14)

124-B. Extractive Metallurgy of Aluminum. R. S. Sherwin. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Apr. 1950, p. 661-667.

Production of alumina from high-grade ores by the Bayer process, including differences between American and European practice. Brief description of some processes for lower grade ores and for electrolytic reduction of oxide to aluminum.
(B14, C23, Al)

125-B. Water Sealed Wind Boxes for Dwight and Lloyd Sintering Machine. E. McL. Tittmann and E. A. Hase. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Apr. 1950, p. 669-670.

Double roasting of sinter carrying a high percentage of lead concentrates, gave rise to the problem of removing the sheets of metallic lead formed in the wind boxes. Solution of the problem was found in use of water-sealed wind boxes. (B16, Pb)

126-B. A New Infrasizer. H. E. T. Haultain. *Canadian Mining and Metallurgical Bulletin*, v. 43, Mar. 1950, p. 128-131; *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 53, 1950, p. 78-81.

New type of infra-sizer has only two cones and splits a 25-g. sample

into two products in 30 min. The coarser is weighed to give an indication of degree of grinding. (B13)

127-B. Notch Sensitivity and Low-Temperature Spalling of Fireclay Refractories. Ralph Rose and R. S. Bradley. *Industrial Heating,* v. 17, Mar. 1950, p. 504, 506. A condensation.

Previously abstracted from *Journal of the American Ceramic Society.* See item 17-106, 1949. (B19)

128-B. Beneficiation of Adirondack Magnetite. W. R. Webb and R. G. Fleck. *Mining Engineering,* v. 187, Apr. 1950, p. 444-448.

Equipment and procedures of Jones and Laughlin Ore Co., Star Lake, N. Y. Future prospects for the area. (B14, Fe)

129-B. The Critical Decades. Harrison Schmitt. *Mining Engineering,* v. 187, Apr. 1950, p. 449-450.

Mineral-resource position and future prospects for the U. S. during the next decades. Recommendations for governmental actions. (B10)

130-B. Use of an Induced Nuclear Reaction for the Concentration of Beryl. A. M. Gaudin, John Dasher, James H. Pannell, and Wilfred L. Freyberger. *Mining Engineering; Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 187, Apr. 1950, p. 495-498

A new sorting process for Be minerals depends upon emission of neutrons upon irradiation by gamma rays, a nuclear reaction which is specific for Be at the appropriate energy level. Signals given by neutrons when ore passes on a belt are changed to mechanical commands through amplifiers and other electrical equipment. (B14, S19, Be)

131-B. Concerning the Adsorption of Dodecylamine on Quartz. A. M. Gaudin and F. W. Bloecher, Jr. *Mining Engineering; Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 187, Apr. 1950, p. 499-505.

Using an adsorption-column technique, the partition of dodecylamine between quartz and water was determined for concentrations of 0.5-4000 mg. per liter. The amount adsorbed in a flotation operation giving almost complete recovery is less than 5% of the amount required for a monolayer. 11 ref. (B14)

132-B. Conditioning and Treatment of Sulphide Flotation Concentrates Preparatory for the Separation of Molybdenite at the Miami Copper Company. C. H. Curtis. *Mining Engineering; Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 187, Apr. 1950, p. 506. (B14, Mo)

133-B. Low Cost Centrifuge Versatile in Laboratory Use. Earl L. H. Sackett. *Mining Engineering,* v. 187, Apr. 1950, p. 466.

Centrifuge built in a local machine shop to serve as a laboratory machine to produce results comparable with those obtained with large-scale centrifugal deslimers. (B14)

134-B. Batch-Test Centrifuge. Earl L. H. Sackett. *Engineering and Mining Journal,* v. 151, Apr. 1950, p. 79-80.

See "Low Cost Centrifuge Versatile in Laboratory Use", *Mining Engineering,* item 133-B, above. (B14)

135-B. How Tonnage and Grade Relations Help Predict Ore Reserves. S. G. Lasky. *Engineering and Mining Journal,* v. 151, Apr. 1950, p. 81-85.

Statistical approach. Why mathematical laws apply to ore deposits. Typical data indicating validity of the method. (B10)

136-B. An Accurate Reagent Feeder for Small Quantities. A. O. Ashman. *Engineering and Mining Journal,* v. 151, Apr. 1950, p. 98-100.

Apparatus for use in pilot-plant flotation tests. (B14)

137-B. The Trend of Iron-Ore Concentration in the Lake Superior District. Edmund C. Bitzer. *Quarterly of the Colorado School of Mines,* v. 45, June 1950, p. 1-5; discussion, p. 5-11.

Trend of concentration practices with respect to the imminent exhaustion of U. S. iron ores. (B14, Fe)

138-B. The Consumption of Balls in Wet-Ball Milling. C. H. Knight and Donald Dyrenforth. *Quarterly of the Colorado School of Mines,* v. 45, Oct. 1950, p. 25-32.

Devaney and Coghill in an analysis of published ball-wear statistics, supported by laboratory tests, have demonstrated that ball wear is proportional to mill power input rather than to tons of ore milled. Their conclusion is supported in this article by additional data from a number of mills, using different types of balls and different ores. (B13)

139-B. Reconnaissance of Metal Mining in the San Juan Region, Ouray, San Juan, and San Miguel Counties, Colo. William H. King and Paul T. Allsman. *U. S. Bureau of Mines,* Information Circular 7554, Mar. 1950, 109 pages.

Includes description of milling methods in an important Au, Ag, Pb, and Zn producing area. Footnote references. (B10, B13, Ag, Au, Pb, Zn)

140-B. Uranium Recovery at Monticello. M. G. McGrath. *Mining World,* v. 12, Apr. 1950, p. 11-13.

Wartime vanadium plant redesigned to process four types of U-V ores. (B general, U, V)

141-B. U. S., Reds: Ore Resource Rivals. *Steel,* v. 126, Apr. 17, 1950, p. 47-48.

Iron-ore reserves available to U. S. and Russia, also those of other nations not conveniently available. (B10, Fe)

142-B. Mining Methods and Costs at the Highland Surprise Mine, Shoshone County, Idaho. D. W. Butner. *U. S. Bureau of Mines,* Information Circular 7560, Mar. 1950, 11 pages.

Includes section on milling Zn-Pb ore. (B13, Zn, Pb)

143-B. The Use of Borax and Boric Acid as Fluxes in the Metallurgy of Heavy Metals. (In German.) Edmund R. Thews and Martin Stromeyer. *Chemische Technik,* v. 2, Feb. 1950, p. 35-39.

Advantages and disadvantages of different fluxes. Borax and boric acid, mixed with each other or with soda and other substances, are excellent fluxes, especially for the melting of Cu-alloy scrap. (B21, C21, A8, Cu)

144-B. (Book) Industrial Minerals. 44 pages. Colorado School of Mines, Department of Publications, Golden, Colo. *Quarterly* of the Colorado School of Mines, No. 4B, v. 45, Oct. 1950. $0.50.

Papers presented at conference on industrial minerals during the 75th Anniversary meetings on "Mineral Resources in World Affairs". Individual papers on metals are abstracted separately. (B10, B14)

C

NONFERROUS EXTRACTION AND REFINING

52-C. Multiple Continuous Casting. *Metal Industry,* v. 76, Mar. 3, 1950, p. 168. Translated and condensed from article by W. Helling and F. Gassner.

Previously abstracted from *Metall.* See item 30C-1950. (C5, Al)

53-C. Macro and Micro-Segregation in Ingots of Two Aluminium Alloys. P. Brenner and H. Kostron. *Metallurgia,* v. 41, Feb. 1950, p. 209-218.

Investigation made to obtain a general idea of micro-segregation in grains at different places in the ingot which show phenomena of inverse segregation. A Hanemann micro-hardness tester was used. Effects of solution heat treatment. (C5, M27, Al)

54-C. Tasks and Problems of Modern Electro-Chemistry. II. (In German.) Friedrich Müller. *Chimia,* v. 3, Dec. 15, 1949, p. 285-292; v. 4, Jan. 15, 1950, p. 1-5.

Reviews literature on electrometallurgy in aqueous solutions, nonmetallic aqueous electrolysis, molten electrolytes, electrothermic processes, and electrochemical gas reactions. 104 ref. (C23)

55-C. Continuous Method of Producing Ductile Titanium. P. J. Maddex and L. W. Eastwood. *Journal of Metals,* v. 188, Apr. 1950, p. 634-640.

Details of apparatus and procedure, including diagram of proposed pilot-plant unit. Magnesium reduces $TiCl_4$ to produce Ti or Ti-alloy ingots. (C26, Ti)

56-C. Large Melting and Annealing Furnaces Featured in Scovill's New Strip Mill. *Industrial Heating,* v. 17, Mar. 1950, p. 404-408, 410, 412, 414-415, 418, 420-422, 544, 546-548, 550, 552.

Flat-metal continuous casting process, which produces large rectangular-section brass bars and continuous strip mill, capable of producing the heaviest cold-rolled and non-welded brass coils in the industry. (C5, F23, J23, Cu)

57-C. Formation of Silicon Carbide During the Electrolysis of Cryolite-Alumina Melts. (In Russian.) P. F. Antipim and L. I. Ivanova. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 70, Jan. 11, 1950, p. 283-284.

When the melt contains silica as an impurity, it is thermally reduced to form silicon and alumina. SiC is then formed by reaction with Al_4C_3 and with carbon. Such formation interferes seriously with the normal reduction of alumina to aluminum, because of the accumulation of the carbide. (C23, Al)

58-C. (Book) Symposium on Metallurgical Aspects of Non-Ferrous Metal Melting and Casting of Ingots for Working. 168 pages. Institute of Metals, 4 Grosvenor Gardens, London, S.W.1, England. 15s. ($2.50.)

Of the six papers, one is concerned with basic principles, one gives a general view of brass practice, and four are straightforward accounts of particular processes. Cu-base alloys dealt with mainly. The various contributions have already appeared in the *Journal* and have been previously abstracted. (C21, C5, EG-a, Cu)

D

FERROUS REDUCTION AND REFINING

69-D. Application and Use of Automatic Controls for Open-Hearth Furnaces. E. Whitehead. *Steel,* v. 126, Mar. 27, 1950, p. 76, 78, 80, 87, 90, 92.

See abstract from *Journal of the Iron and Steel Institute,* item 11-319, 1949. (D2, ST)

70-D. Open-Hearth Steelmakers

Stress Control of Bath Temperature. *Steel,* v. 126, Mar. 27, 1950, p. 84, 87.

Summarizes proceedings of Chicago section meeting of National Open Hearth Steel Committee, AIME, Mar. 8, 1950. (D2, ST)

71-D. Increased Open Hearth Production by Improved Charging Methods. R. Tietig. *Iron and Steel Engineer,* v. 27, Mar. 1950, p. 64-72; discussion, p. 72-77.

Modernized equipment. (D2, ST)

72-D. Checker Brick Design, Construction and Use. Jay J. Seaver. *Iron and Steel Engineer,* v. 27, Mar. 1950, p. 94-98.

Experience with checker work in blast-furnace stoves indicates that openhearth checker brick should not be thicker than 2½ in. (D1)

73-D. Experimental Operation of a Basic-Lined Surface-Blown Hearth for Steel Production. C. E. Sims and F. L. Toy. *Iron and Steel Engineer,* v. 27, Mar. 1950, p. 116, 118, 120. A condensation.

See abstract of "Turbo-Hearth Process Promises Quality Steel in 12 Minutes", *Steel,* item 44-D, 1950. (D3, Fe)

74-D. Some Notes on Heating Problems in Steel Works. (In Swedish.) P. Löfström. *Jernkontorets Annaler,* v. 134, no. 1, 1950, p. 24-40.

Thermal efficiencies and sources of loss in steelmaking and rolling. Recommended improvements in furnace construction and operation to minimize such losses. (D general, F21, ST)

75-D. The Perrin Process. (In Swedish.) R. Perrin. *Jernkontorets Annaler,* v. 134, no. 1, 1950, p. 1-23.

Details of process for deoxidation and desulfurization of steel. Advantages in combination with various steelmaking processes. Application to steelmaking with pure raw materials. (D general, ST)

76-D. Use of Adirondack Sinter in Blast Furnaces. Emer H. Riddle. *Journal of Metals,* v. 188, Apr. 1950, p. 641-645.

Data on blast-furnace results obtained from concentrated Adirondack magnetite produced by Jones & Laughlin. (D1, Fe)

77-D. Blowing Out Carbon-Hearth Furnaces. George D. Sells and H. P. Saxer. *Journal of Metals,* v. 188, Apr. 1950, p. 646-647.

Separate articles describe experiences of Pittsburgh Steel Co., and Jones & Laughlin Steel Corp. (D1, Fe)

78-D. Conditions of Outstanding Blast Furnace Operation. Kurt Neustaetter. *Journal of Metals,* v. 188, Apr. 1950, p. 651-655.

Various cases of top production of blast furnaces were compared. Only one favorable condition (such as low slag volume, good structure of ore or coke, or high top pressure) will not result in record production. A number of favorable factors combined with absence of unfavorable factors is necessary to achieve best results. 10 ref. (D1, Fe)

79-D. Application of Superimposed Precipitators. R. E. Touzalin. *Journal of Metals,* v. 188, Apr. 1950, p. 656-660.

Installation of McKee equipment, for the fine cleaning of blast-furnace gas in a tower scrubber and electrostatic precipitator combination. (D1, Fe)

80-D. Experimental Operation of a Basic-Lined Surface-Blown Hearth for Steel Production. C. E. Sims and F. L. Toy. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, Apr. 1950, p. 694-708.

A series of 1000-lb. experimental heats of regular basic pig iron was surface blown with air jets on a basic hearth using burned lime to produce a basic slag. After a processing period of about 12 min., depending on rate of air delivered, steels were produced with an average composition of 0.03% C, 0.08% Mn, less than 0.01% Si, 0.024% P, 0.021% S, and 0.003% N. Temperature was increased 300° F. by the heat of reaction. (See abstract of condensed version in *Steel,* item 44-D, 1950.) (D3, ST)

81-D. Operations of a Basic-Lined Surface-Blown Hearth for Steel Production. C. E. Sims and F. L. Toy. *Industrial Heating,* v. 17, Mar. 1950, p. 450-452, 454, 456. A condensation.

See abstract of "Turbo-Hearth Process Promises Quality Steel in 12 Minutes", *Steel,* item 44-D, 1950. (D3, ST)

82-D. Evaluating Resistance of Refractories to Carbon Monoxide Disintegration. J. A. Shea. *Industrial Heating,* v. 17, Mar. 1950, p. 500, 502.

See abstract of "Blast Furnace Brick Disintegration Test Equipment and Test Procedure", *American Ceramic Society Bulletin.* See item 17-76, 1949. (D1, B19, Fe)

83-D. Chemical Changes in Basic Brick During Service. T. F. Berry, W. C. Allen, and R. B. Snow. *Journal of the American Ceramic Society,* v. 33, Apr. 1, 1950, p. 121-132.

See abstract of condensed version from *Industrial Heating,* item 17-74, 1949. (D2)

84-D. Apparatus for Preparation of Metals With an Exactly Known Content of Impurities. J. D. Fast. *Philips Technical Review,* v. 11, Feb. 1950, p. 241-244.

See abstract of "An Apparatus for Preparing Small Samples of Pure Iron to Which Fixed Quantities of Impurities Can Be Added", *Philips Research Reports,* item 11-380, 1949. (D8, Fe)

85-D. Design of a Large Vacuum Valve; Its Application to an Electric Furnace. W. F. Atkins and G. C. H. Jenkins. *Metallurgia,* v. 41, Mar. 1950, p. 266-267; *Machinery* (London), v. 76, Mar. 9, 1950, p. 351-352.

See abstract from *Engineering,* item 55-D, 1950. (D8, Fe)

86-D. Application of Oxygen in Metallurgy. Present Status and Future Possibilities. (In French.) G. Husson. *Revue de Métallurgie,* v. 47, Jan. 1950, p. 88-91.

Methods, unsolved problems, applications, and future prospects. Restricted to ferrous practice. (B22, Fe)

87-D. Use of a Stream of Gas for Desulfurization of Granules of Iron Produced by the Krupp Direct Reduction Process. (In French.) F. Kakiuchi and Z. Yamamoto. *Circulaire d'Informations Techniques,* v. 6, Aug.-Sept.-Oct. 1949, p. 367-379. Translated from *Tetsu to Hagane* (Japanese), v. 28, Dec. 1942, p. 1273-1281.

Laboratory experiments on the above, using hydrogen. After 5 hr., 80% of the carbon and 45% of the phosphorus were eliminated. Coke-oven gas may be used after preliminary removal of part of the methane and inorganic sulfur compounds. (D8, Fe)

88-D. Improving Blast Furnace Practice. P. E. Cavanagh. *Metal Progress,* v. 57, Apr. 1950, p. 463-467.

The thesis is advanced that evolution of the iron blast furnace has reduced man-hours of labor to a minimum. It is therefore believed that future progress will be toward increasing smelting efficiency without disturbing labor efficiency. Present efforts along this line and their practical limitations. (D1, Fe)

89-D. Blast-Furnace Gas Cleaning; Methods for Calculating the Motions of Particles in a Gas. J. Stringer. *Journal of the Iron and Steel Institute,* v. 164, Mar. 1950, p. 294-304.

Curves and nomograms by means of which measurements of particle free-falling speeds may be extrapolated to give the terminal velocity under conditions existing within the plant. Method is said to give more accurate results than those obtained by applying Stokes' law and extrapolating far beyond its limit of validity. (D1, ST)

90-D. Blast-Furnace Gas Cleaning; An Analysis of Plant Performance. R. F. Jennings. *Journal of the Iron and Steel Institute,* v. 164, Mar. 1950, p. 305-325.

Principles of operation and possible ways of improving separating power and mechanical efficiency. 17 ref. (D1, ST)

91-D. Kinetics of Reduction of Ferric Oxides. (In Russian.) O. A. Esin and P. V. Gel'd. *Uspekhi Khimii* (Progress in Chemistry), v. 18, Nov.-Dec. 1949, p. 658-681.

Theoretical and experimental viewpoints, as applied to blast-furnace reduction of iron ore. Practical factors such as size of ore lumps and their porosity, pressure, composition, and temperature of gas, etc. 87 ref. (D1, Fe)

92-D. Operating Properties of Crown Dinas Brick (Physicochemical Processes Causing Fusion of Dinas in Openhearth Roofs). (In Russian.) I. S. Kainarskii and V. D. Tsigler. *Ogneupory* (Refractories), v. 14, Dec. 1949, p. 532-538.

Information submitted by various steel works shows that good fusion is dependent on the presence of large amounts of the tridymite form of silica, rather than quartz and crystobalite. Introduction of additions increasing the tendency of Dinas brick to transform into tridymite results in higher fusibility. (D2)

E

FOUNDRY

113-E. Second Operations on Die Castings Cost More Than You Think! Rupert Le Grand. *American Machinist,* v. 94, Mar. 20, 1950, p. 98-99.

In theory, die casting does most of the work on a part; but in practice, trimming and machining generally cost more than die casting. How AC Spark Plug Div., General Motors Corp. improved this situation. (E13, G15, G17)

114-E. Design Factors for Precision Castings. *American Machinist,* v. 94, Mar. 20, 1950, p. 120.

Recommendations. (E15)

115-E. Aircraft Punch and Die Casting. G. A. Robinson. *Iron Age,* v. 165, Mar. 23, 1950, p. 65-68.

Procedures followed by Northrop Aircraft to insure production of dies and punches that will accurately reproduce air-flow contours. Precautions required to prevent contamination and to hold shrinkage to a normal minimum. After melting, skimming, and fluxing, the Zn-alloy dies are cast around plaster patterns and molding-sand in a wooden flask. Then the Pb-alloy punches are cast onto the Zn-alloy dies. (E11, Pb, Zn)

116-E. Radiator Section Molds Made Four Per Minute. Pat Dwyer. *Foundry,* v. 78, Apr. 1950, p. 70-75, 201-202.

Automatic equipment and procedures for making molds for casting iron steam and hot-water heating radiators. (E19, CI)

117-E. Which Molding Method? Pat Dwyer. *Foundry,* v. 78, Apr. 1950, p. 88-89, 126, 128.

Various alternate procedures for molding a specific angle-plate gray-iron casting. (E19, CI)

118-E. Handling Materials at the Shakeout. Robert H. Herrmann. *Foundry,* v. 78, Apr. 1950, p. 90-95, 229-230.

Equipment and procedures. (E24)

119-E. Machine Molding Large Dry Sand Cores. M. J. Kellner. *Foundry,* v. 78, Apr. 1950, p. 146-148.

Use of jolt-squeeze, roll-over draw machine for this job is believed to be unique method. (E21)

120-E. A Universal Blow Plate. W. Paul Morton. *Foundry,* v. 78, Apr. 1950, p. 176-177.

Success of the plate depends upon exchangeable bushings that function as either blowhole or vent. Method of matching the corebox to the blow plate using a Plexiglas model. (E21)

121-E. Magnesium Die Casting in Germany. Part II. Cold Chamber Methods and Technical Problems. Alfred F. Bauer. *Modern Metals,* v. 6, Mar. 1950, p. 27-33.

Cold-chamber machines are compared with the hot-chamber models. Special problems such as metal temperature, die temperature, and injection interval for the two systems. (E13, Mg)

122-E. Equipment for Degassing Magnesium Alloy Melts. Alex J. Juroff. *American Foundryman,* v. 17, Mar. 1950, p. 28-29.

Simple apparatus for degassing using compressed chlorine from standard commercial cylinders. (E25, Mg)

123-E. Nodular Graphite Structures. H. Morrogh. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Feb. 1950, p. 251-298.

Comprehensive report of experimental work, including a review of the literature. Principal similarities of the effects of Ce, Mg, and Ca; producing nodular structures with Ca; production of nodular structures by addition of Mg to the melt before casting; influence of Mg in cast iron; influence of Mg and Ce together on hyper-eutectic irons; Mg in hypo-eutectic cast irons; and some outstanding problems of the cerium process. Includes mechanical test data and photomicrographs. 63 ref. (E25, M27, CI)

124-E. Foundry Chaplets. R. Jolly. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Feb. 1950, p. 299-315.

Previous published work and an investigation made to determine the effects of tinning procedure and thickness and composition of chaplet coatings. Includes high-quality photographs. 12 ref. (E21, L16)

125-E. Slag/Metal Reactions in the Iron Foundry. J. Bernstein. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Feb. 1950, p. 317-332.

Reviews some of the literature. Chemical compositions of slags from different melting furnaces; principles of desulfurization and dephosphorization. 46 ref. (E10, CI)

126-E. Casting Copper-Lead Alloys; Theoretical Aspects—Practical Problems. P. D. Liddiard and P. G. Forrester. *Metal Industry,* v. 76, Mar. 3, 1950, p. 163-165; Mar. 10, 1950, p. 191-193.

Theoretical aspects, such as the equilibrium diagram of the system. Practical methods of casting. (E general, M24, Cu, Pb)

127-E. The Melting and Casting of Nonferrous Metals. (In Dutch.) M. Stap. *Metalen,* v. 4, Feb. 1950, p. 114-118.

A few problems connected with the above. A special method of casting Al and Mg ingots. (E general, Al, Mg)

128-E. Automatic Nitrogen Ladling. *Production Engineering & Management,* v. 25, Apr. 1950, p. 53.

Equipment for transferring molten aluminum from the melting furnace to a die-casting machine, by use of compressed nitrogen. (E13, Al)

129-E. Design Factors in Investment Casting. T. F. Frangos. *Tool Engineer,* v. 24, Apr. 1950, p. C38-C40.

Clarified by graphs and diagrams. Practice at Haynes-Stellite. (E15)

130-E. Molds Dried Rapidly and Uniformly in Car Type Oven. *Industrial Heating,* v. 17, Mar. 1950, p. 490-492, 494.

Oven used in a gray-iron foundry for efficient drying of sand molds and cores. (E18)

131-E. Pattern Engineering and Foundry Practice. *Canadian Metals,* v. 13, Mar. 1950, p. 24-27, 49.

Need for coordinating design and production of castings. Serious errors in pattern design. (E17)

132-E. Ruston & Hornsby's New Manufacturing Facilities—The Beevor Foundry. *Foundry Trade Journal,* v. 88, Mar. 16, 1950, p. 285-295.

Specifications, melting practice, dry sand and green sand molding, and routine tests. (E11, CI)

133-E. Polish Foundry Research Institute and Its Activities. (In French.) K. Gierdziejewski. *Fonderie,* Jan. 1950, p. 1903-1907.

Organization and facilities. Research programs of the past two years. (E general, A9)

134-E. Absorption of Moisture by Cores. (In French.) Pierre Nicolas. *Fonderie,* Jan. 1950, p. 1908-1913.

Method and apparatus used for determination of the above for certain bonding agents used in production of foundry cores, particularly for the case when slack cores will be re-used. (E18)

135-E. Elimination of Cracks in Reentrant Angles by Use of Chills. (In French.) Georges Blanc. *Fonderie,* Jan. 1950, p. 1915-1916.

Applicable to bronze castings. (E11, Cu)

136-E. Tilting Crucible for Permanent Molds. Arthur Q. Smith. *Industrial Gas,* v. 27, Apr. 1950, p. 10, 28.

Used for pouring permanent-mold Al castings. (E12, Al)

137-E. Steel Foundry Core and Molding Sands. John Howe Hall. *Foundry,* v. 78, Apr. 1950, p. 79, 188, 190, 192, 194, 196-198, 200.

Required properties of molding sand for production of steel castings. Tests for determining permeability, green and dry strength, and other properties of sand mixtures. (To be continued.) (E18, CI)

138-E. From a Metallurgist's Notebook: Laminated Forks. H. H. Symonds. *Metal Industry,* v. 76, Mar. 24, 1950, p. 228.

Inclusions trapped in the metal during casting were found to be the cause of laminations in forks submitted for examination. Methods used to determine the reason for this defect. Compositions are not given. (E25, M27)

139-E. Production of a Die-Cast Fuel Valve Body. *Machinery* (London), v. 76, Mar. 30, 1950, p. 465-468.

Die-casting procedure for an Al alloy valve. (E13, T7, Al)

140-E. Basic Principles of Die Design. H. K. Barton and L. C. Barton. *Machinery* (London), v. 76, Mar. 30, 1950, p. 468-470.

For die casting. Discusses positive registrations. (Continued; see item 112-E, 1950.) (E13)

141-E. Burn's Court Foundry Reconstruction. John Blakiston. *Foundry Trade Journal,* v. 88, Mar. 23, 1950, p. 307-316.

Equipment and procedures of a group of iron and steel foundries in Calcutta, India. (E general, CI)

142-E. Modern Australian Grey-Iron Foundry. V. A. Saveneh. *Foundry Trade Journal,* v. 88, Mar. 30, 1950, p. 335-340, 348. (E11, CI)

143-E. Dimensions and Efficiencies of Cupola Furnaces. (In German.) Karl Roesch and Kurt Guthmann. *Neue Giesserei,* v. 37 (new ser., v. 3), Mar. 9, 1950, p. 85-92.

Design and conditions for optimum operation, based on correlation of experiences with 520 furnaces. 10 ref. (E10, CI)

144-E. Pig Iron in Ferrous Foundry Practice. (In German.) Carl W. Pfannenschmidt. *Neue Giesserei,* v. 37 (new ser., v. 3), Mar. 23, 1950, p. 105-113.

Importance of pig iron to the quality of castings. Shows that certain defects in castings can be traced back to the raw material. 16 ref. (E10, CI)

145-E. (Book) The Solidification of Castings. R. W. Ruddle. Institute of Metals, 4 Grosvenor Gardens, London, S.W.1, England. 10s., 6d. ($2.00)

Reviews literature concerning rates of solidification and temperature gradients in castings. First part: Gating and feeding methods, the design of feeders, and the use of chills and molding materials of different thermal properties. Second and major part: Investigations of the fundamental principles of solidification. Results of mathematical analysis, "pour-out" methods, direct temperature measurement, and electrical-analogue methods. 161 ref. (E25)

146-E. (Book) Foundry Science. Harry A. Schwartz. 286 pages. Pitman Publishing Corp., 2 West 45th St., New York 14. $6.50.

An effort to interpret the findings of the scientist to the industrial technologist. Application of scientific principles, beginning with the structure of matter, in terms of electrons and protons and forces which hold atoms together as molecules. Electrical conductivity, thermal conductivity, specific heat, laws of equilibria and transformations, fluid mechanics, etc., related to foundry processes. (E general)

147-E. (Book) Pattern Making. Ed. 8. J. G. Horner and P. Gates. 390 pages. Technical Press, Gloucester Road, Kingston Hill, Surrey, England. 18s.

Developments in metal patterns and plate-pattern work, as well as illustrations of modern machinery for this purpose. (E17)

F

PRIMARY MECHANICAL WORKING

74-F. What Price Scale; Some Ideas for Cost Cutting. Harry L. Showalter, Jr. *Steel Processing,* v. 36, Mar. 1950, p. 143-149.

Advantages of scale-free heating in the steel mill, showing possible cost savings by use of one or more of the direct-heating methods which minimize scaling: induction; high-speed gas heating; electrical heating plus protective atmosphere; and the lithium process which combines protective atmosphere with direct gas or oil-fired heating. (F21, ST)

75-F. Alan Wood Puts Hot Strip Mill in Operation. *Iron and Steel Engineer*, v. 27, Mar. 1950, p. 122-123, 126. (F23, ST)

76-F. Forty-Six Years of "Know-How" Built Into the New Colorado Fuel and Iron Rod Mill at Pueblo. *Wire and Wire Products*, v. 25, Mar. 1950, p. 211-215. (F27, ST)

77-F. Non-Ferrous Wire Manufacture in England. *Wire and Wire Products*, v. 25, Mar. 1950, p. 218-220, 246-248. Reprinted from *Metal Industry*.

Equipment and processes. Copper and Cu-base alloys are drawn into various wire forms. (F28, Cu)

78-F. Progress in the Production Forge Industry. Waldemar Naujoks. *Tool Engineer*, v. 24, Mar. 1950, p. 32-33.

Large closed die forgings and equipment for their production. Recent inspection and forging techniques and recent forging materials —Ti, Al, high-temperature alloys. (F22, Ti, Al, SG-h)

79-F. Complex Steel Parts Produced by Hot Extrusion Process. J. Sejournet. *Materials & Methods*, v. 31, Mar. 1950, p. 56-58.

Recent French extension of the hot-extrusion process to a variety of steels, which makes possible forming of alloy parts with high and uniform strength properties. (F24, ST)

80-F. Elementary Theory of Rolling. M. Gensamer. *American Institute of Mining and Metallurgical Engineers*, Institute of Metals Div., Symposium Series, Vol. 2, "Nonferrous Rolling Practice", 1948, p. 1-13.

Calculation of force and power requirements and of distribution of strains in the formed object. (F23)

81-F. Hot and Cold Rolling of Nickel and High-Nickel Alloys. Mortimer P. Buck and Norman C. Britz. *American Institute of Mining and Metallurgical Engineers*, Institute of Metals Div., Symposium Series, Vol. 2, "Nonferrous Rolling Practice", 1948, p. 33-60; discussion, p. 60-61.

Practical metallurgical aspects and equipment. (F23, Ni)

82-F. Rolling Copper and Copper Alloys. William Marsh Baldwin, Jr. *American Institute of Mining and Metallurgical Engineers*, Institute of Metals Div., Symposium Series, Vol. 2, "Nonferrous Rolling Practice", 1948, p. 63-112; discussion, p. 112-115.

Rolling of flat products. Effects of casting, annealing, pickling, scalping, coiling, on rolling and its effects on forming, finishing, cutting, joining, etc. 74 ref. (F23, Cu)

83-F. The Rolling of Zinc. W. M. Peirce. *American Institute of Mining and Metallurgical Engineers*, Institute of Metals Div., Symposium Series, Vol. 2, "Nonferrous Rolling Practice", 1948, p. 117-127; discussion, p. 127-128.

Differences in rolling Zn from other metals; major uses. Includes table of mechanical properties. (F23, Q general, Zn)

84-F. Metallurgical Problems in Rolling Aluminum Alloys. John Alden. *American Institute of Mining and Metallurgical Engineers*, Institute of Metals Div., Symposium Series, Vol. 2, "Nonferrous Rolling Practice", 1948, p. 129-148; discussion, p. 148-151.

History; preparation of ingots for hot rolling, hot rolling, and cold rolling. Data on mechanical properties. (F23, Q general, Al)

85-F. The Hot and Cold Rolling of Magnesium-Base Alloys. G. Ansel and J. O. Betteron, Jr. *American Institute of Mining and Metallurgical Engineers*, Institute of Metals Div., Symposium Series, Vol. 2, "Nonferrous Rolling Practice", 1948, p. 153-205; discussion, p. 205-210.

Present-day practice; laboratory and development rolling experiments; future possibilities. Data on mechanical properties. 69 ref. (F23, Q general, Mg)

86-F. Rolling and Work Hardening Characteristics of Some Precious Metals. Carl H. Samans. *American Institute of Mining and Metallurgical Engineers*, Institute of Metals Div., Symposium Series, Vol. 2, "Nonferrous Rolling Practice", 1948, p. 211-235; discussion, p. 235-237.

General rolling characteristics and effects of impurities. Data on hardness. 26 ref. (F23, Q29, EG-c)

87-F. An Appraisal of Wire Products in Industry. W. F. Hodges. *American Institute of Mining and Metallurgical Engineers*, Institute of Metals Div., Symposium Series, Vol. 3, "Rod and Wire Production Practice", 1949, p. 1-5; discussion, p. 5.

History and development of wire production. Drawing and rolling processes, corrosion, and coatings. Applications in general. (F28, R general, L general)

88-F. The Production of High-Carbon Steel Wire. Carleton W. Garrett. *American Institute of Mining and Metallurgical Engineers*, Institute of Metals Div., Symposium Series, Vol. 3, "Rod and Wire Production Practice", 1949, p. 6-13; discussion, p. 13-15.

Cleaning, patenting, wire-drawing, and cold-working practices. (F28, L12, J25, CN)

89-F. The Hot Rolling and Cold Drawing of Stainless Rods and Wire. J. K. Findley. *American Institute of Mining and Metallurgical Engineers*, Institute of Metals Div., Symposium Series, Vol. 3, "Rod and Wire Production Practice", 1949, p. 16-18; discussion, p. 18-22.

Progress and difficulties involved. (F28, F27, SS)

90-F. Hot and Cold Working of Monel Rods and Wire. Mortimer P. Buck and Norman C. Britz. *American Institute of Mining and Metallurgical Engineers*, Institute of Metals Div., Symposium Series, Vol. 3, "Rod and Wire Production Practice", 1949, p. 23-30; discussion, p. 30-33.

Processes used by the Huntington Works, International Nickel Co. (F28, F27, Ni)

91-F. The Production of Copper and Copper Alloy Rods and Wire by Rolling and Drawing. Philip H. Kirby. *American Institute of Mining and Metallurgical Engineers*, Institute of Metals Div., Symposium Series, Vol. 3, "Rod and Wire Production Practice", 1949, p. 34-49; discussion, p. 49.

Various processes, the basic principles and essential machinery used. (F28, F27, Cu)

92-F. Production of Copper-Base Alloy Rod by Hot Extrusion. W. D. France and L. E. Thelin. *American Institute of Mining and Metallurgical Engineers*, Institute of Metals Div., Symposium Series, Vol. 3, "Rod and Wire Production Practice", 1949, p. 50-64; discussion, p. 64.

Theory and practice. (F24, Cu)

93-F. Fabrication of Aluminum and Aluminum Alloy Rod, Bar and Wire. W. T. Ennor. *American Institute of Mining and Metallurgical Engineers*, Institute of Metals Div., Symposium Series, Vol. 3, "Rod and Wire Production Practice", 1949, p. 65-77.

Typical equipment and rolling practices. Several important products and their uses. (F27, F28, Al)

94-F. Production of Magnesium Alloy Bar, Rod, and Wire. G. Ansel. *American Institute of Mining and Metallurgical Engineers*, Institute of Metals Div., Symposium Series, Vol. 3, "Rod and Wire Production Practice", 1949, p. 78-81.

Extrusion process; mechanical properties for the products. (F24, Mg)

95-F. Progress Resulting From Use of Direct-Current Drives for Heavy Reversing Rolling-Mill Trains. (In German.) Hellmut Bauer. *Stahl und Eisen*, v. 70, Feb. 2, 1950, p. 90-96.

With the use of d.c. drives, the rolling operation is so much more rapid that ingots can be rolled in one heat, with resulting increased efficiency and reduced energy consumption. (F23)

96-F. Tube Quality and Output Boosted by Improved Production Processes. *Production Engineering & Management*, v. 25, Apr. 1950, p. 55-62.

"Rigidized" tubing is made from strip steel which has been deeply embossed with various designs. It is then fabricated by resistance welding. Subsequent operations include trimming or rolling, flash-butt welding, and air hammering for precision tubing. Materials are carbon, alloy, and stainless steel. (F26, CN, AY, SS)

97-F. Rolling Flats With Corrugated Passes. A. Lhermitte. *Blast Furnace and Steel Plant*, v. 38, Apr. 1950, p. 423-426. (F23)

98-F. Forging Weldless Steel Rings. James Blane. *Western Machinery and Steel World*, v. 41, Mar. 1950, p. 82-84.

Equipment and procedures. Design of the rollers, using hydraulically operated mandrels and rolls, differs from anything in commercial operation today. Rings from 50 to 2500 lb. in weight, from 8 to 76 in. o.d., and in lengths up to 20 ft., have been produced. (F22, ST)

99-F. Cold Extrusion of Steel. Merle H. Davis. *Finish*, v. 7, Apr. 1950, p. 47-48, 73.

Military interest and current progress in process developed in Germany. (F24, ST)

100-F. Automatic Gas-Fired Forge Furnace Meets Need for Versatility. James R. Ross. *Industrial Heating*, v. 17, Mar. 1950, p. 426-428, 431.

Furnace at Chevrolet Forge Div., General Motors Corp. (F22, ST)

101-F. First Pipe Leaves New Twin Mills. *Iron Age*, v. 165, Apr. 13, 1950, p. 102-103.

Picture story of two U. S. Steel subsidiary, electric-weld, pipe mills at Orange, Tex. (Consolidated Western Steel Corp.) and McKeesport, Pa. (National Tube Co.). (F26, CN)

102-F. Technical Progress in Forging Equipment. R. E. W. Harrison. *Steel Processing*, v. 36, Apr. 1950, p. 177-182.

Historical development. (F22)

103-F. Working Ductile Zirconium. E. T. Hayes, E. D. Dilling, and A. H. Roberson. *Steel*, v. 126, Apr. 17, 1950, p. 82-84, 96, 99-100.

Adaptability of Zr for stamping and drawing in the production of small parts, and its amenability to forging larger shapes, counterbalance some of the restrictions imposed by lack of suitable casting methods. How satisfactory sheet and rod can be forged and rolled at 1560° F. by protecting the metal from oxidation with an iron sheath. (F22, F23, G general, Zr)

104-F. Production of Semifinished Steel. Parts I-II. Karl L. Fetters and

H. H. Hottel. *Steel,* v. 126, Apr. 10, 1950, p. 102, 105-106, 108, 111-112; Apr. 17, 1950, p. 86, 88, 90, 93.

Part I: Heating of steel ingots prior to rolling into semifinished forms. Various types of soaking-pit furnaces in use today, fuels utilized, and methods of heating. Part II: Different types of blooming mills in use today. (To be continued.)
(F21, F23, ST)

105-F. Cold Rolling Mills; Considerations Involved in Their Selection. L. R. Underwood. *Sheet Metal Industries,* v. 27, Apr. 1950, p. 293-306, 308.
(F23)

106-F. (Book) **Nonferrous Rolling Practice.** 237 pages. 1948. American Institute of Mining and Metallurgical Engineers, 29 West 39th St., New York. (Institute of Metals Division, Symposium Series, Vol. 2.)

Theory and practice of rolling for Ni, Cu, Zn, Al, Mg, their alloys, and some precious metals. Individual papers are abstracted separately.
(F23, EG-a)

107-F. (Book) **Rod and Wire Production Practice.** 81 pages. 1949. American Institute of Mining and Metallurgical Engineers, 29 West 39th St., New York. (Institute of Metals Division, Symposium Series, Vol. 3.)

Application and production of rod and wire by hot rolling, cold drawing, and hot extrusion. Materials include high-carbon steel, heat resisting alloys, Monel, Cu, Al, Mg, and their alloys. Individual papers are abstracted separately. (F27, F28)

G

SECONDARY MECHANICAL WORKING

93-G. Chevrolet Adopts a New Torque Transmission. Thomas E. Lloyd. *Iron Age,* v. 165, Mar. 16, 1950, p. 71-75.

Design and fabrication procedures, which represents a radical departure from production techniques heretofore used in converter manufacture. It is made from sheet-metal stampings by use of many dies and assembly fixtures. Miscellaneous drawing, blanking, piercing, and forming operations, also annealing procedures. (To be concluded.)
(G1, J23, T21, ST)

94-G. How To Boost the Output of Multiple-Slide Presses. Part I. Tooling Details. Part II. Auxiliary Equipment. Part III. Control and Operating Procedure. Otto C. Held. *American Machinist,* v. 94, Feb. 6, 1950, p. 73-77; Feb. 20, 1950, p. 124-129; Mar. 20, 1950, p. 100-104.

Explains what must be done to adapt tooling to high-speed operation. (G1)

95-G. "Zipper" Die Closes and Crimps Tube Seam. H. A. Waldon. *American Machinist,* v. 94, Mar 20, 1950, p. 121.

How intake and exhaust stacks for Deere tractors are formed in two press operations from 0.036-in. thick steel blanks. (G1, ST)

96-G. Estimating Drawing Pressure. Tyler G. Hicks. *American Machinist,* v. 94, Mar. 20, 1950, p. 139.

Nomogram and worked example applicable to shells. (G4)

97-G. Evolution and Analysis of Drawing Lubricants. G. A. Cairns. *Steel Processing,* v. 36, Mar. 1950, p. 135-137, 149. A condensation.

See abstract from *Finish,* item 55-G, 1950. (G21)

98-G. Tungsten Carbide Tooling for Cold Heading. Part III. W. E. Montgomery and W. Leigh. *Steel Processing,* v. 36, Mar. 1950, p. 138-141, 152-153.

Final installment: Design of cut-off quills and cut-off knives. Dimensional specifications. (G10, C)

99-G. Production Bender Boosts Output 250 Pct. *Iron Age,* v. 165, Mar. 23, 1950, p. 69.

The job is to make two 180° bends in 1½-in. diam. brass tubing having wall thickness of 0.032 in. The bending machine is adaptable not only to round tubing and bars, but also to rectangular and square stock and rolled or extruded sections. (G6, Cu)

100-G. Standardization of Hotpoint Range Bodies Paves Way for Mass Production Records. P. D. Aird. *Modern Industrial Press,* v. 12, Mar. 1950, p. 13-14, 16, 20.

Forming and welding operations. (G1, K general, T10)

101-G. Brazing Preforms Can Be Produced by Coining. *Iron Age,* v. 165, Mar. 30, 1950, p. 106.

New technique subjects silver-wire rings of circular cross section to pressures up to 180,000 psi. between smooth polished dies. The washers, used for fusing, bonding, brazing, and soldering, are produced in a variety of shapes and sizes.
(G3, K8, Ag)

102-G. High Production Bolt Manufacture. Wade Palmer. *Western Machinery and Steel World,* v. 41, Mar. 1950, p. 66-69, 91.

Machines produce complete bolts in one automatic sequence of operations, from coils of wire to containerful of finished bolts. Sequence of operations consists of shearing, body extrusion, button heading, thread extrusion, pointing, and roll threading. (G general, T7, CN)

103-G. Cold Heading Costs Cut by Combination Tooling. *Production Engineering & Management,* v. 25, Apr. 1950, p. 54.

Use of tungsten carbide for heading and stamping of trademarks, and other emblems on bolts, rivets, etc., in one operation. (G10, T7, C)

104-G. Tooling for Hot-Machining of Hard-to-Cut Metals. Henry James. *Machinery* (American), v. 56, Apr. 1950, p. 152-157.

Investigations by Sam Tour & Co., New York, for the U. S. Navy, on factors involved in turning heated metal in a lathe. Tests were conducted on low, medium, and high-carbon steel, and a high-temperature alloy, Allegheny Ludlum S-816 (42.15% Co, 19.74% Ni, 19.50% Cr, 4.30% W, 3.05% Cb, 2.65% Fe, 1.43% Mn, 0.34% C, and 0.23% Si). Heating was by induction or by gas flame.
(G17, CN, AY, Co)

105-G. Marforming—Deep Drawing and Forming Without Wrinkles. R. Burt Schulze. *Machinery* (American), v. 56, Apr. 1950, p. 172-177.

Process developed by Glenn L. Martin Co. (G1)

106-G. Rotary Broaching — New Technique for Finishing Stampings. R. E. Coles. *Machinery* (American), v. 56, Apr. 1950, p. 178-183.

Improved surface finish, rapid production, and accuracy are obtained by method which requires inexpensive tooling. (G17)

107-G. Cold Roll Forming of Metals. E. J. Vanderploeg. *Tool Engineer,* v. 24, Apr. 1950, p. C20-C26.

See abstract of "Cold Roll Forming of Sheet and Strip", *American Society of Mechanical Engineers,* Paper No. 49-S-3, 1949; item 19A-136, 1949. (G11)

108-G. Broaching Application for Cost Reduction. O. W. Bonnafe. *Tool Engineer,* v. 24, Apr. 1950, p. C36-C37. (G17)

109-G. The Role of Cutting Fluid as a Lubricant. K. E. Bisshopp, Eric F. Lype, and Severin Raynor. *Lubrication Engineering,* v. 6, Apr. 1950, p. 70-73; discussion, p. 73-74.

Analytical investigation showed that in two-dimensional metal cutting a continuous lubricant film does not exist in the sense usually considered in lubrication problems. Oil, CO_2, Cl_2, and water are considered as lubricating media. 13 ref. (G21)

110-G. Second Operations on Stampings Show Ingenious Tool Engineering. E. E. Bangs and C. V. Seagers. *American Machinist,* v. 94, Apr. 3, 1950, p. 117-121.

Tools, dies, and machines that shave, broach, roll ball ways, curl tight edges, and induction-braze multiple connections on assemblies at plant of L. C. Smith & Corona Typewriters. (G17, K8)

111-G. From a Metallurgist's Notebook: Hot Brass Stampings. H. H. Symonds. *Metal Industry,* v. 76, Mar. 17, 1950, p. 207-208, 211.

Siliceous inclusions were found to be responsible for excessive tool wear when machining certain hot brass stampings. Methods of examination used in determining the reason for this difficulty. (G17, M27, Cu)

112-G. Material and Heat Balance During Oxy-Acetylene Cutting of Low-Carbon Steel. (In Russian.) G. L. Petrov. *Avtogennoe Delo* (Welding), Dec. 1949, p. 20-24.

Results of extensive experimental investigation. (G22, CN)

113-G. Preheating Thin Sheets of Structural Steels During Cutting. (In Russian.) G. B. Evseev and T. A. Degtyar. *Avtogennoe Delo* (Welding), Dec. 1949, p. 24-27.

Influences of preheating the cutting oxygen, and also of preheating the steel to be cut, on rate of cooling of the edges. It was found that preheating the oxygen to 380° C. has little influence on rate of cooling; but that the rate decreases significantly when the steel is preheated.
(G22, CN)

114-G. Low-Pressure Oxygen Cutting of Stacks of Steel Plates. (In Russian.) S. V. Begun. *Avtogennoe Delo* (Welding), Dec. 1949, p. 28-30.

Technique. Influences of thickness of individual sheets, total thickness of the stack, and gap between sheets on efficiency of cutting. (G22, CN)

115-G. Proceedings of Moscow Conference on Rapid Methods for Working of Metals. (Continued.) (In Russian.) B. G. Lyul'chenko. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, Nov. 1949, p. 9-12; Dec. 1949, p. 1-6.

Concludes summary of conference of Mar. 22-26, 1949. Deals with machining problems. (G17)

116-G. Method of Production of Wear-Resistant Dies. (In Russian.) M. M. Il'in. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, Dec. 1949, p. 6-10.

Problem of excessive wear of embossed stamping dies. Choice of material, chemical and thermal treatment, welding on of hard alloy embossing materials, and other technological and economic factors.
(G3, T5, AY)

117-G. Shaping and Milling of Milling Cutters by an Anodic-Mechanical Method. (In Russian.) G. S. Belyaev. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, Dec. 1949, p. 11-12.

Applicability of the method was investigated. Optimum operating conditions for different shapes and purposes. Set-ups are diagrammed. (G17)

118-G. **Mechanical Joining of Hard-Alloy Cutting Tips.** (In Russian.) I. G. Turchaninov. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, Dec. 1949, p. 18-19.

Method of joining hard alloy cutting tips to the cutting wheels of milling machines. (G17, K13)

119-G. **Some Problems Connected With the Pressing of Motor-Car Body Panels.** G. A. Knight. *Sheet Metal Industries*, v. 27, Apr. 1950, p. 325-334.

Considered from the point of view of both the mechanical features of presses, and the metallurgical characteristics of the low-carbon steel used. Mechanical properties, grain sizes, stress-strain characteristics, and aging effects. (G1, T21, CN)

120-G. **Correct Machining of Copper-Base Alloys Shrinks Both Tool and Production Costs.** Malcolm Buell and J. J. McGuinness. *Steel*, v. 126, Apr. 17, 1950, p. 78-81.

Recommendations for tool design and rates. Diagrams show form and angular dimensions of tools for turning, milling, drilling, reaming, carbide-tool boring, tap and die chasers, circular chasers, taps, and tangential chasers. Alloys are classified in several groups. (G17, Cu)

121-G. **Aluminum: Protected Better by Porcelain Enamel.** *Ceramic Industry*, v. 54, Apr. 1950, p. 47, 164.

Recommended blanking and forming procedures for 61S Al alloy, preliminary to porcelain enameling. First of series of articles. (G2, Al)

122-G. **Powder Cutting and Scarfing of Stainless Steels.** C. W. Powell. *Welding Journal*, v. 29, Apr. 1950, p. 308-310.

Procedures and equipment, including typical operating data. (G22, SS)

123-G. **The Story Behind Cut-Wire Shot.** *SAE Journal*, v. 58, Apr. 1950, p. 54-56. Based on "Process Development—the Link Between Engineering and Manufacturing", by R. J. Emmert.

Development, manufacture and use for peening and cleaning. It is claimed to last longer than ordinary shot, to produce less wear of the equipment, to increase fatigue life of parts peened, and to maintain size uniformity better than ordinary shot. Includes cost comparison. (G23, L10, T5, CN)

124-G. **Spinning Wrought Ironheads.** Edward B. Story. *Machine and Tool Blue Book*, v. 46, Apr. 1950, p. 79-80.

Production of flanged and dished heads, in which temperature, spinning speed, and roller application govern procedure. (G13, CI)

125-G. **Drawing and Annealing Copper Shells.** Royden Pratt and J. J. McGuinness. *American Machinist*, v. 94, Apr. 17, 1950, p. 115, 117. (G4, J23, Cu)

126-G. **The Organisation and Work of the B.S.A. Group Machinability Research Laboratory.** K. J. B. Wolfe and Peter Spear. *Engineer*, v. 189, Mar. 24, 1950, p. 352-354; Mar. 31, 1950, p. 401-403.

British laboratory engaged in work for a group of companies in development of cutting tools, including design, manufacture, testing, and practical operation; development of tool materials, including manufacture and ultimate uses; improvement of machining properties of existing and new materials; determination of correct machining techniques for existing and new materials; development of cutting fluids; and fundamental research on machining. (G17)

127-G. **Manufacture of Fusion-Welded Pressure Vessels by Babcock and Wilcox, Limited.** *Engineering*, v. 169, Mar. 31, 1950, p. 344-346; *Engineer*, v. 189, Mar. 31, 1950, p. 385-388; *Welding*, v. 18, Apr. 1950, p. 140-149.

Equipment and procedures for forming plates; welding seams, nozzles and branches by multi-layer and submerged arc methods; radiographic inspection of welds; and testing the finishing vessels. (To be continued.) (T26, G1, K1, S13, ST)

128-G. **Drilling of Light Alloys.** (In French.) Gaston Laval and René Schweyckart. *Revue de l'Aluminium*, v. 27, Jan. 1950, p. 9-16; Feb. 1950, p. 63-69.

Extensive details of recommended equipment and procedures. (G17, Al, Mg)

129-G. **Results of Systematic Investigation of the Sawing of Aluminum and Aluminum Alloys.** (In German.) E. Von Burg. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 16, Feb. 1950, p. 33-43.

Effects of various factors on the band-sawing of Al. At a given cutting rate, it was found that there is a certain correlation between required feed pressure and shear strength, tensile strength, and Brinell hardness of the material. Conditions for optimum cutting efficiency. (G17, Al)

130-G. **(Book) Machine Tools for Engineers.** Charles R. Hine. 355 pages. McGraw-Hill Book Co., 330 West 42nd St., New York 18. $3.50.

First of two volumes on manufacturing processes evolved from courses developed at Rensselaer Polytechnic Institute. Aim is to introduce the student to the fundamentals of machine tools and production processes from the viewpoint of the engineer, rather than from that of the machinist. Chapters cover cutting tools, measurement, the lathe, threads and threading, honemaking, the shaper, the planer, the milling machine, broaching, abrasives and grinding, microfinishes, boring machines, gear making, jig boring, sawing, and turret lathes. (G17)

131-G. **(Book) Schnitt-Stanz-und Ziehwerkzeuge.** (Blanking, Stamping, and Drawing Equipment.) G. Oehler and F. Kaiser. 272 pages. Springer-Verlag, 20 Reichpietschufer, Berlin 35, Germany. 18 D.M.

Presswork tolerances and types of presses; various parts of press tools and tool sets for different types of workpieces, including compound and follow-on tools; bending and forming tools. (G1)

H — POWDER METALLURGY

28-H. **Hot Pressing Beryllium Powder.** A. U. Seybolt, J. P. Frandsen, and R. M. Linsmayer. *Steel*, v. 126, Mar. 27, 1950, p. 71-74, 96.

Previously abstracted from *U. S. Atomic Energy Commission*, AECD-2679. See item 5C-22, 1949. (H14, Be)

29-H. **Some Thoughts on Powder Metallurgy.** *Light Metals*, v. 13, Mar. 1950, p. 148-150.

Some recent publications and patents on production of high-strength, Al-alloy, powder-metallurgy products. (H general, Al)

30-H. **Note on Surface Diffusion in Sintering of Metallic Particles.** N. Cabrera. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Apr. 1950, p. 667-668.

In a recent paper Kuczynski studied the rate at which the crack between a metallic plane and a spherical particle of the same material is filled up gradually when heated at temperatures near the melting point. Law of growth of radius of contact between plane and sphere was studied and a relationship with time and a self-diffusion constant was deduced. The present author attempts to show, by mathematical analysis, that Kuczynski's equation is incorrect. (H15, N1)

31-H. **Copper Powder Metallurgy Given Impetus by Japanese Utilizing of Pulp Mill Liquor.** Kannosuke Hayami. *Mining World*, v. 12, Apr. 1950, p. 42.

New method of precipitating pure Cu powder from $CuSO_4$ solution. The solution is mixed with waste sulfite pulp liquor, the proportion varying with Cu content, and is digested for about 3 hr. at 140° C. (H10, Cu)

32-H. **How Tooling Affects Design of Metal Powder Parts.** Wm. M. Stocker, Jr. *American Machinist*, v. 94, Apr. 17, 1950, p. 89-96.

Molding and compacting equipment; fabrication and design of parts. (H14)

33-H. **The Initiation of Reactions Between Solid Phases.** A. Smekal. *Industrial Diamond Review*, new ser., v. 10, Mar. 1950, p. 73-76.

Previously abstracted from *Powder Metallurgy Bulletin*. See item 5A-57, 1949. (H12)

34-H. **S.A.P.—An Aluminum Powder Metallurgy Product.** (In Dutch.) K. J. van de Loo. *Metalen*, v. 4, Mar. 1950, p. 149-152.

Development, production, properties, and possible uses of improved material made by a new patented process. Graphic, tabular, and photographic comparison is made with "Avional M" and other similar products. (H10, Al)

J — HEAT TREATMENT

74-J. **Flash Annealing Furnace for Light Alloy Sheet.** *Light Metals*, v. 13, Mar. 1950, p. 146-147. (J23, Al)

75-J. **Cutting Costs by Improved Heat Treating Methods.** E. J. Pavesic. *Iron Age*, v. 165, Mar. 30, 1950, p. 98-100.

Recommended equipment and procedures applicable to tool and die steels. (J general, TS)

76-J. **Large Continuous Furnaces for Annealing Brass.** *Metal Progress*, v. 57, Mar. 1950, p. 327-331.

Special furnace installations which epitomize fundamental change now going on in the nonferrous industry from hand operation of small units to mechanical handling of large units. Last of three articles on various features of Scovill Mfg. Co.'s new brass mill. (J23, Cu)

77-J. **Modern Heat Treating. I. The Salt Bath. II. Traditional Operations.** William Adam, Jr., and Leon B. Rosseau. *Metal Progress*, v. 57, Mar. 1950, p. 332-334; Apr. 1950, p. 498-501.

Part I: Advantages and disadvantages. Internal-heating equipment. Part II: "Traditional" operations of annealing, quenching and hardening of steel, using the salt bath. (J2)

78-J. **Dry Cyaniding in a Special Gas Furnace.** *Industrial Gas*, v. 28, Mar. 1950, p. 7, 26-27.

Installation at Commercial Steel Treating Corp., Detroit. (J28, ST)

79-J. **High Production Furnace—Versatile Tool for Controlled Atmosphere Heat Treating.** W. A. Lundy.

Industrial Gas, v. 28, Mar. 1950, p. 12-13, 27-29.
Equipment developed by Surface Combustion Corp. (J2)

80-J. Bright Carbonitriding of Steel Accomplished in Automatic Furnace. H. N. Ipsen. *Materials & Methods*, v. 31, Mar. 1950, p. 61-63.
How combination of protective atmosphere and automatic control of quenching medium insured bright, clean surfaces and uniform case depth, and eliminated distortion of a wide range of parts. (J28, ST)

81-J. Heat Treatment of Gear Steels. *American Machinist*, v. 94, Apr. 3, 1950, p. 167, 169.
Condensed recommendations, including tables. (J general, T7, AY)

82-J. Comprehensive Heat Treating. M. E. Richardson. *Western Machinery and Steel World*, v. 41, Mar. 1950, p. 70-73.
Facilities of Russell, Burdsall & Ward Bolt and Nut Co. Microstructures before and after treating are illustrated. Limited to steels. (J general, ST)

83-J. Special Gas Furnaces Cut Fuel Costs, Improve Dry Cyaniding. *Steel*, v. 126, Apr. 10, 1950, p. 85-86.
Automatic, gas-fired, batch-type units which give one large steel heat treater operating advantages in case hardening a wide variety of steel parts. (J28, ST)

84-J. Composition of Atmospheres Inert to Heated Carbon Steel. R. W. Gurry. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Apr. 1950, p. 671-687.
Series of charts giving compositions of all gas mixtures containing the elements C, H, O, and N, which at 1000-1800° F. are in equilibrium with (1) austenite of various carbon contents, (2) iron and iron carbide, (3) graphite, and (4) iron and its oxide. 11 ref. (J2, Cn)

85-J. Some Notes on the Nitriding of High Speed Steel. J. G. Morrison. *Tool Engineer*, v. 24, Apr. 1950, p. C13-C16.
Procedures, and mechanical properties resulting from various nitriding and stress-relief schedules. (J28, TS)

86-J. Automatic Control Helps To Save the Cost of One Furnace by Increasing Production of Others. M. A. Embertson. *Instruments*, v. 23, Mar. 1950, p. 236-237.
Results achieved through installation of a new patenting furnace for carbon steel wire complete with fully automatic control equipment. (J25, S18, CN)

87-J. Trouble Shooting in Tool Hardening. R. Stewart. *Canadian Metals*, v. 13, Mar. 1950, p. 10-13, 47, 50-51.
Causes and cures of many tool failures; prescribed manufacturing and heat treating; and results of improper preparation and use of tools. (J26, TS)

88-J. The Annealing of Nickel and High-Nickel Alloys. (Continued.) *Metallurgia*, v. 41, Feb. 1950, p. 191-196; Mar. 1950, p. 251-255.
Feb. issue: Soft, open, closed, salt-bath, electric-resistance, torch, dead-soft, temper, and low-temperature annealing. Mar. issue: Bright annealing, age hardening of "K" Monel, and various auxiliary factors. (J23, Ni)

89-J. A Center Quenched Hardenability Bar for Shallow Hardening Steels. Earl J. Eckel. *Metal Progress*, v. 57, Apr. 1950, p. 474-476.
Development of satisfactory test utilizing a simpler test bar. The proposed bar is drilled longitudinally and off-center to give a cylinder of varying wall thickness. When such a bar is quenched, cooling rate is a maximum in the thinnest section and gradually decreases to a minimum in the thickest section. Hence, by quenching, then sectioning transversely at its midpoint, and taking hardness measurements in a circle concentric with the periphery of the bar, an indication of hardenability is obtained. (J26, ST)

90-J. Quenching of Carburized Gears. S. L. Widrig and Wilson T. Groves. *Metal Progress*, v. 57, Apr. 1950, p. 482-486.
Importance of quenching techniques in comparison with such things as "grain" and "fiber", prior heat treatment, and part geometry. Quenching practices in use at Spicer Mfg. Div.; plug and press fixture quenching; and open-tank quenching. (J26, T7, CN)

91-J. Hardness Variations in Carbon-Molybdenum Steels After Tempering. R. D. Chapman and W. E. Jominy. *Metal Progress*, v. 57, Apr. 1950, p. 491-492, 492B, 493-496.
Systematic data on tempered hardness as a function of as-quenched hardness for six steels of series 4000. (J26, J29, AY)

92-J. Localized Heating. Paul A. Furkert. *Gas Age*, v. 105, Apr. 13, 1950, p. 26-28, 65-66.
Use of gas flames for localized heating of metal articles, as used in welding, stress relieving, brazing of aluminum, etc. Disadvantages of salt-bath heating. (J general, K general)

93-J. Getting More Out of Heat Treating. Part I. Howard E. Boyer. *Steel Processing*, v. 36, Apr. 1950, p. 195-198.
Review of some of the basic principles involved in the heat treatment of steel. An attempt is made to correlate some of these principles with end results and the relation of such results to engineering applications. Basic principals of metallic structures and transformations. (J general, N8)

94-J. Protective Atmospheres in Industry. Parts XIV-XV. A. G. Hotchkiss and H. M. Webber. *General Electric Review*, v. 53, Mar. 1950, p. 36-39; Apr. 1950, p. 36-41.
Part XIV: Diverse industrial uses including inert-arc welding, safety in handling dusts or finely powdered materials, and for general purging operations in furnaces, gas holders, etc. Highly reducing atmospheres for processes such as atomic hydrogen welding and sodium hydride descaling. Part XV: Remedial measures for protective-atmosphere troubles sometimes encountered during operation. Possible sources of impurities and how to locate them. (To be continued.) (J2, K1, L12)

95-J. The Diffusion of Carbon and the Carburization Process. J. Taylor. *Journal of the Iron and Steel Institute*, v. 164, Mar. 1950, p. 257-264.
Difficulty of assessing case depths when shapes of curves are different. Method for calculating the relative active carburizing and soaking times when it is desired to reduce the surface carbon concentration of a carburized case. 12 ref. (J28, ST)

96-J. A Comparison of Six Spring Steels. Part I. Hardenability and Resistance to Grain Growth and Decarburization. Part II. Jominy Hardenability and Mechanical Properties After Hardening and Tempering. A. S. Kenneford and G. C. Ellis. *Journal of the Iron and Steel Institute*, v. 164, Mar. 1950, p. 265-277.
10 ref.
(J26, Q general, SG-b, CN, AY)

K JOINING

194-K. Efficient Tank Fabrication Requires Special Equipment. A. I. Nussbaum. *American Machinist*, v. 94, Mar. 20, 1950, p. 89-92.
Power-operated weld positioners and rotators combine with specially designed welding (submerged melt) and X-ray inspection for economical production of massive processing equipment. Includes hot spinning and punch-press perforation. Illustrated. (K1, G2, G13, S13, T26, ST)

195-K. Neat Application of Steel Stud Welding. *Light Metals*, v. 13, Mar. 1950, p. 166-167.
Installation of floor-to-floor window frames in the new United Nations Secretariat Building, which was simplified and speeded by use of stud-welded fasteners. Cd-plated steel studs are welded to I-beam sections, which are cast in the concrete floor. (K1, T26, Al)

196-K. Chevrolet Adopts Automatic Transmission. Thomas E. Lloyd. *Iron Age*, v. 165, Mar. 23, 1950, p. 70-74.
Assembly, spot welding, brazing, materials handling, and inspection procedures (mostly mechanical gaging). Second of two articles. (K3, K8, S14, T21, ST)

197-K. Cutting Costs by Improving Resistance Welding Tooling. Clarence C Broner. *Iron Age*, v. 165, Mar. 30, 1950, p. 102-103.
Welding methods using equipment produced by Sciaky Bros. (K3)

198-K. Testing Adhesion in Glass-Metal Seals. Norman Allen. *Metal Progress*, v. 57, Mar. 1950, p. 337-338.
Simple and rapid test. A bead of the glass under investigation is welded onto a length of wire or rod of the metal. This test piece is then subjected to tensile testing. (K11)

199-K. New Indium-Bearing Solders Have Improved Alkali Resistance. S. M. Grymko and R. I. Jaffee. *Materials & Methods*, v. 31, Mar. 1950, p. 59-60.
Joints made with these new soft solders in mild steel did not lose strength even after 31-day immersion in strong alkaline solutions. A range of alloy compositions containing 10-50% In, 0-50% Pb, and 0-90% Sn was tested, with emphasis on modifications of the 50-50 Pb-Sn type. The most desirable solder investigated contained 25% In, 37.5% Pb, and 37.5% Sn. (K7, R5, Pb, Sn, In, CN, SG-f)

200-K. Welding on Products Line in Service. L. J. Bernard, C. C. McRoy, J. N. Stephens, and A. B. Hannah. *Petroleum Engineer*, v. 22, Mar. 1950, p. D56, D58, D60.
Recommended procedures for safety and satisfactory results. Only electric-arc welding is used. (K1, ST)

201-K. Spot Welding; A Comparison of British and American Practices. A. J. Hipperson. *Welding*, v. 18, Mar. 1950, p. 112-117.
Limited to mild steel sheet. (K3, CN)

202-K. Developments in Locomotive Construction. *Welding*, v. 18, Mar. 1950, p. 118-122.
Some developments in application of welding to British locomotive construction. (K general, T23, ST)

203-K. Repair of Locomotive Plate Frames by Metallic Arc Welding. (Concluded.) *Engineering*, v. 169, Mar. 3, 1950, p. 251-253.
Described, diagrammed, and illustrated. (K1, T23, CN)

204-K. The Schnadt Tests and Their Applications to Welding. *Welder,* new ser., v. 18, Oct.-Dec. 1949, p. 74-77.
Theories of Henri Schnadt, on which his tests are based, are a radical departure from many of the principles underlying the present-day standard tests. They are said to create an entirely new conception of the properties of metals, and their originator claims that they show many of our existing standards to be both meaningless and sometimes completely misleading.
(K9, Q general)

205-K. Properties at Low Temperatures. E. C. Rollason. *Welder,* new ser., v. 18, Oct.-Dec. 1949, p. 78-79, 90.
Mechanical properties at temperatures down to −60° C. of welds in steels made with Murex (British) electrodes. (K1, Q general, ST)

206-K. The Development and Future Prospects of Electric Arc Welding in Spanish Naval Shipyards. Antonio Villanueva Nuñez. *Welder,* new ser., v. 18, Oct.-Dec. 1949, p. 81-84. Translated and condensed from the Spanish.
(K1, T22, ST)

207-K. Spotlight on Arc Welding. IV. *Welder,* new ser., v. 18, Oct.-Dec. 1949, p. 85-88.
Weld fabrication of a variety of heavy equipment by a British firm.
(K1, ST)

208-K. Certain Metallurgical Peculiarities of Automatic Welding at High Speeds. (In Russian.) B. I. Medovar. *Avtogennoe Delo* (Welding), Nov. 1949, p. 3-7.
Interaction of metal and slag during automatic welding under flux at a rate of 120-150 meters per hr. was investigated for low-carbon steel (8-12 mm. thick) with a 200-kv. arc. Influence of arc length, of degree of oxidizability of flux, and of proportion of electrode metal in the weld on chemical composition of weld metal was determined. Optimum welding conditions for different situations. 13 ref. (K1, CN)

209-K. Spot Welding of "SKhL2" Steel With Electrothermal Treatment. (In Russian.) A. S. Gel'man and S. S. Astaf'ev. *Avtogennoe Delo* (Welding), Nov. 1949, p. 7-14.
Experimental investigation of effectiveness of electrothermal treatment of the welds in a low-alloy structural steel 4-8 mm. thick. A substantial improvement of mechanical properties was achieved by this treatment. Optimum conditions for different thicknesses of steel.
(K3, J1, CN)

210-K. Influence of Type of Electrode on Geometry of Welds. (In Russian.) A. A. Erokhin. *Avtogennoe Delo* (Welding), Nov. 1949, p. 14-21.
Investigation of welding of low-carbon and 18-8 stainless steel, using a variety of electrode types. Relations between height of bead, width and depth of fusion, current, rate of welding, efficiency of heating process, length of arc, and voltage.
(K1, CN, SS)

211-K. Investigation of the Welding Arc in Argon. (In Russian.) A. Y. Brodskii. *Avtogennoe Delo* (Welding), Nov. 1949, p. 21-23.
Results of research on arc parameters during static conditions in commercial argon (86.6% A, 12.7% N_2, 0.6% O_2, and 0.1% CO_2), taking into consideration the depth of the welding crater. Causes of deformation of tips of tungsten electrodes.
(K1)

212-K. Welding Medium-Carbon Steel With "TsM-7" Electrodes. (In Russian.) A. S. Shapiro and K. M. Sun'kov. *Avtogennoe Delo* (Welding), Nov. 1949, p. 23-25.
Applicability of above electrodes—originally designed for welding low-carbon steel—to welding of medium-carbon steel was investigated. Results of mechanical tests of the welds. Composition of electrodes.
(K1, CN)

213-K. New Apparatus for Welding of Aluminum Wires and Soldering. (In Russian.) I. A. Antonov. *Avtogennoe Delo* (Welding), Nov. 1949, p. 26-28.
Specially developed devices for welding Al cables and conductors and for soldering and preheating. Operating characteristics.
(K general, Al)

214-K. Electrical Spot Welding Under Flux Using a Special Gun Developed by E. O. Paton's Institute of Electric Welding of the Academy of Sciences of the U.S.S.R. (In Russian.) V. I. Kuznetsov and M. I. Kunis. *Avtogennoe Delo* (Welding), Nov. 1949, p. 30-31.
Manually operated welding gun and method of operation. (K3)

215-K. "Redux" Bonding of Aircraft Structures. C. J. Moss. *Aero Digest,* v. 60, Apr. 1950, p. 52-53, 94-96.
Use of adhesive bonding of Al alloy assemblies of British aircraft. Mechanical test data.
(K12, Q general, Al)

216-K. Latest Press-Shop Methods Produce Latest Torque Converter. Charles H. Wick. *Machinery* (American), v. 56, Apr. 1950, p. 158-167.
How hydraulic torque converters for automatic transmissions are made from precision stampings spot welded and copper-brazed to pressed-metal housings.
(K3, K8, G3, T21, CN)

217-K. Metal Bonding. *Mechanical Engineering,* v. 72, Apr. 1950, p. 331-332.
Redux process which employs the adhesive properties of synthetic resins for the bonding of metal to metal and metal to other materials such as wood and plastics.
(K11, K12)

218-K. Designing for Projection Welding. Wallace A. Stanley. *Product Engineering,* v. 21, Apr. 1950, p. 113-117.
How to use projection welding for sheet stock, forgings, curved surfaces, waterproof joints, wire, and fasteners. Shape, size, and shear strength of common types of projections and basic rules for obtaining successful joints. (From book to be published by McGraw-Hill.) (K3)

219-K. Spot Welded Joint Details for Lower Cost Assembly. *Product Engineering,* v. 21, Apr. 1950, p. 130-131.
Diagrams and captions show edge design, methods of bracing corners, self-locating sections, and other details. (K3)

220-K. Welding With Wurlitzer. Clayton B. Herrick. *Industry & Welding,* v. 23, Apr. 1950, p. 24-25.
Use of resistance and inert-arc welding in joining Al parts of juke boxes. (K1, Al)

221-K. Welded Design Streamlines Railroad Cars. Roy L. Rex. *Industry & Welding,* v. 23, Apr. 1950, p. 34-35.
Flame and arc welding.
(K1, K2, T23, CN)

222-K. Some Thought Starters on Welded Design. *Industry & Welding,* v. 23, Apr. 1950, p. 38, 52, 54.
Diagrams for building machinery bases. (K general, T26)

223-K. Texas to Ohio Pipeline. *Industry & Welding,* v. 23, Apr. 1950, p. 40-42, 68.
Arc welding illustrated. (K1, CN)

224-K. Weldbrazing. Lew Gilbert. *Industry & Welding,* v. 23, Apr. 1950, p. 48-49.
Process was developed primarily to avoid harmful deterioration of the steel structure in the weld zone as well as in the heat affected zone, and to make possible the welding of types of steel which are not weldable by usual methods at the present time. Instead of the nonferrous alloys used in normal brazing, special steel filler alloys have been developed for joining and building up iron, steel, cast iron, copper, brass, bronze, nickel, and other metals and alloys without actual fusion.
(K8, L24, SG-f)

225-K. Making Rotors and Turbine Wheels for Newest Allison 400 Jet Engine. *Automotive Industries,* v. 102, Apr. 1, 1950, p. 38-39, 76, 78.
Arc-butt welding for joining heat resistant alloy drop forgings to alloy steel shafts; also several milling and broaching operations.
(K1, G17, T25, AY)

226-K. Underwater Welding Aids Ship Salvage. Robert H. Burks. *Welding Engineer,* v. 35, Apr. 1950, p. 20-22.
Techniques used by U. S. Navy to refloat two ships which the Germans had sunk in the harbor of Cherbourg.
(K1, T22, CN)

227-K. Gas Welding Aluminum Awnings. *Welding Engineer,* v. 35, Apr. 1950, p. 23.
(K2, T26, Al)

228-K. "Double Ending" Saves Welding Time, Cuts Handling. *Welding Engineer,* v. 35, Apr. 1950, p. 24-25.
How assembly lines at Santa Clara plant of Bechtel Corp. use production methods, including automatic welding, for pipe-line construction. "Double ending" or joining two 30-ft. lengths cuts field welding in half.
(K1, CN)

229-K. Modern Shop Practice for Modern Ranges. Gerald Eldridge Stedman. *Welding Engineer,* v. 35, Apr. 1950, p. 28-31.
Resistance welding, forming, assembly, and finishing operations.
(K3, G general, L general, T10, ST)

230-K. Building Diesels by Unit Assembly. E. F. McCaleb. *Welding Engineer,* v. 35, Apr. 1950, p. 32-35.
Equipment and procedures of General Electric Co. Emphasis is on assembly and welding operations.
(K general, T25)

231-K. Production Brazing. Clinton E. Swift. *Welding Engineer,* v. 35, Apr. 1950, p. 36-38.
Claims savings of 40-60% when sheet metal or light-wall tubing is to be fabricated by brazing. Typical examples. (K8, T26)

232-K. Precision Instruments Precision Welded. Lee H. Judge. *Welding Engineer,* v. 35, Apr. 1950, p. 39.
Miscellaneous applications of spot welding by Taylor Instrument Co.
(K3, T8)

233-K. Big Welding Jobs in Australia. *Welding Engineer,* v. 35, Apr. 1950, p. 40.
Four examples of welded heavy machinery—presses and torch cutting machine. (K general, T5, CN)

234-K. Digests of Papers Presented at Electric Welding Conference. *Electrical Engineering,* v. 69, Apr. 1950, p. 361-364.
Covers following papers presented at Detroit, Apr. 5-7, 1950, and not scheduled for publication: "New Electrodes for Stabilizing Inert-Gas Welding Arcs", J. D. Cobine; "The Electric Arc in Argon and Helium", T. B. Jones; "Arc Welding Machine Characteristics as They Affect the Welding Arc", George R. Wagner; "Welding Characteristics of Mechanical Rectifier-Type Arc Welder", K. L. Hansen; "Hydraulic Control of Transformer-Type Arc Welders", A. C. Mulder; "High-Frequency Induction Welding", J. R. Bondley; "An Ampere-Squared-Second Indicator for Resistance Welding", N. P. Mil-

lar; "Design of Transformers for Resistance Welding Machines", Dean L. Knight; "Multi-Transformer Welding Presses", Jack Ogden; "Ignitrons for Frequency-Changer Welders", R. R. Rottier; "The Effect of the Duration of Voltage Dip on Cyclic Light Flicker", L. Brieger; "Probabilities of Interference Between Resistance Welders", W. K. Boice; and "Welding Power System With Series Capacitors at Main Transformer Primaries". (K1, K3)

235-K. Bonding of Rubber to Metal by Means of New Chemical Derivatives of Rubber. Jacques Gossot. *Rubber Chemistry and Technology,* v. 23, Jan.-Mar. 1950, p. 281-291.

Previously abstracted from *Revue Générale du Caoutchouc.* See item 22A-92, 1949. (K11)

236-K. Welded Construction of Barking Drums. George M. Dick. *Canadian Metals,* v. 13, Mar. 1950, p. 34-37.

Arc welded construction of machinery subject to heavy shock load, used in the pulp and paper industry. (K1, T29, ST)

237-K. Welded Railway Coaches. Hugh G. Jarman. *Canadian Metals,* v. 13, Mar. 1950, p. 40, 42.

Fabrication by arc welding. (K1, T23, ST)

238-K. Welding of Light Alloys. (In French.) Gustave Caminade. *Fonderie,* Jan. 1950, p. 1914-1915.

Various methods for welding of Al alloys. (K general, Al)

239-K. Some Technological Problems in Gas Pressure Welding. (In Russian.) A. S. Fal'kevich. *Avtogennoe Delo* (Welding), Dec. 1949, p. 2-5.

Two methods as applied to steels: Heating pieces to be welded to plasticity and welding under constant pressure (solid phase); and applying low pressure to objects and then increasing pressure during heating (liquid or semi-liquid phase). Influence of temperature, compression forces, and oxide inclusions in weld metal on structural and mechanical properties of welds. (K2, ST)

240-K. Successive Heating of Thin Sheets by Multiflame Torches. (In Russian.) W. N. Rykalin and M. Kh. Shorshorov. *Avtogennoe Delo* (Welding), Dec. 1949, p. 5-13.

As applied to manufacture of welded pipe. Influence of number and size of individual jets, spacing between jets, and acetylene consumption. Design of the torches and method of their use. (K2, F26, CN)

241-K. Equipment and Burners for Gas Pressure Welding. (In Russian.) T. A. Vladimirskii and M. S. Nikitin. *Avtogennoe Delo* (Welding), Dec. 1949, p. 13-16.

Four types of equipment and their operating characteristics. (K2)

242-K. Porcelain Nozzle for Inert-Arc Welding. William A. Mays. *Metal Progress,* v. 57, Apr. 1950, p. 489-490.

Experimental work on the helium-shielded arc welding of thin sheet metals required a small porcelain or ceramic nozzle that could be used with 1/16 or 0.040-in. tungsten electrodes. The problem was solved by adapting the porcelain insulator of an old spark plug to form a nozzle for a small manual electrode holder. (K1)

243-K. Progress in Rail Pressure Welding. Lem Adams. *Welding Journal,* v. 29, Apr. 1950, p. 283-289.

Historical review, modern practices in pressure welding of rail, and résumé of experiences with this type of joint. (K2, T23, CN)

244-K. Stability Tests of Welding Machines. Charles L. Volff. *Welding Journal,* v. 29, Apr. 1950, p. 290-292.

French arc-welding specifications are reviewed. The principle of stability tests, methods used, and their significance. (K1)

245-K. Should the Guided-Bend Test Be Modified? *Welding Journal,* v. 29, Apr. 1950, p. 293-304.

Extensive discussion of paper by L. K. Stringham (item 22B-286, 1949). Discussers are W. A. Miller, Perry C. Arnold, F. Lang, and Bela Roney. (K9)

246-K. Weldment Design and Engineering Practice. Anthony K. Pandjiris. *Welding Journal,* v. 29, Apr. 1950, p. 305-308.

Fundamentals of the engineering, planning and designing of economical and safe weldments and the necessary follow-through. (K general)

247-K. Evaluation of Tests for Steels for Welded Structures. P. J. Rieppel, R. G. Kline, and C. B. Voldrich. *Welding Journal,* v. 29, Apr. 1950, p. 195s-212s.

Principal objective of research was to evaluate the usefulness of various small mechanical test specimens for indicating performance of large welded structures. Test specimens described in the literature were catalogued and appraised for studying strength, ductility, and notch toughness of welded joints in structural steels. Four of the most promising specimens were selected for further evaluation. (K9, Q23, CN)

248-K. Brazing of Steel. Part I. Elements of Brazing. Part II. Physical Chemistry of Brazing. S. L. Case. *Steel Processing,* v. 36, Mar. 1950, p. 125-129, 161; Apr. 1950, p. 183-185, 199, 206.

Based on research at Battelle Memorial Institute sponsored by Air Materiel Command. Part I: Definitions; the brazing process; form of brazing alloys and methods of application; design of brazed joints; surface preparation of base metal; and flux and fluxing. Part II: Wetting of base metal by brazing alloy; effect of surface condition on wettability; evaluation of wettability; surface tension and capillary flow of brazing alloys; and flow of brazing alloy as a function of base metal-alloy-flux system. (K8, P10, ST)

249-K. How To Repair Tools by Atomic Hydrogen Welding. R. J. Tierney. *Iron Age,* v. 165, Apr. 13, 1950, p. 86-88.

Welding without destroying heat treated properties is solved by the high-temperature shielded flame. The process also permits economical fabrication of new composite dies by welding toolsteel onto less costly base metals. (K1, TS)

250-K. Ingenuity Plus Arc Welding Speed Big Brine Piping Job. M. N. Vuchnich. *Heating, Piping & Air Conditioning,* v. 22, Apr. 1950, p. 86-87.

Method of welding 45,000 ft. of 1¼-in. floor piping for an ice arena. (K1, CN)

251-K. A Survey of Modern Theory on Welding and Weldability. (Continued.) D. Séférian. *Sheet Metal Industries,* v. 27, Apr. 1950, p. 339-346.

The problem of weldability from three aspects—operative, metallurgical, and structural or general weldability. General phenomena of welding; chemical changes in the fusion zone; absorption of gases by molten metal; and precipitation of compounds from solid solution. Begins discussion of eutectic transformations. (To be continued.) (K9)

252-K. Welding of Corrosion and Heat Resisting Steels. J. A. McWilliam. *Welding,* v. 18, Mar. 1950, p. 94-99; Apr. 1950, p. 150-156.

Weldability, with reference to the particular techniques required. In the first part the subject is treated from the metallurgical aspect; and in second, processes suitable for fabrication with these steels are surveyed. (K general, SS, SG-g, h)

253-K. Welding Wrought and Cast Iron. L. Sanderson. *Machinery Lloyd* (Overseas Edition), v. 22, Mar. 18, 1950, p. 83-87, 89.

Various methods. (K general, CI, Fe)

254-K. Faults in Arc Welds in Mild and Low Alloy Steels. *Welding Research,* v. 4 (bound with *Transactions of the Institute of Welding,* v. 13), Feb. 1950, p. 3r-15r.

Typical faults are defined and illustrated. Reasons for their occurrence and ways in which they may be avoided and corrected. Description of each type of fault; cause and prevention; effect on strength; and correction. (K1, CN, AY)

255-K. A Review of Selected Papers on the Flash and Butt Welding of Light Alloys. P. M. Teanby. *Welding Research,* v. 4 (bound with *Transactions of the Institute of Welding,* v. 13), Feb. 1950, p. 16r-20r.

Deals only with aluminum. (K3, Al)

256-K. Explosion of a Compressed Air Container Caused by Poor Welding. (In German.) Emil Banik. *Schweissen und Schneiden,* v. 2, Feb. 1950, p. 36-38.

Defective weld-repair job of an old pressure tank, the explosion of which caused the death of a workman. (K general, T26, CN)

257-K. (Book) Welding Technology. F. Koenigsberger. 280 pages. 1949. Cleaver-Hume Press, 42a S. Audley St., London, W. 1, England. 21s. net.

The various welding processes, plant, and equipment. Types of joint, precautions, and welding procedures for ferrous and nonferrous metals. The various methods of flame cutting and gouging. Welding manipulators and fixtures, safety precautions, protective clothing, plant maintenance, distortion and residual stresses, weld strengths and faults, design principles and estimating. (K general)

258-K. (Book) Electric Arc Welding Manual. Vol. II. Metallurgy. 182 pages. Murex Welding Processes, Ltd., Waltham Cross, Herts., England. 8s., 6d.

Subjects useful to designers, welding engineers, and supervisors who want to know more about what happens when different materials are welded. Chapters deal with physical metallurgy of iron and steel; cast iron; wrought iron and mild steel; high-tensile and alloy steels; nonferrous metals; hard facing alloys; shrinkage stresses and cracking; and mechanical and nondestructive testing. (K1)

L

CLEANING, COATING AND FINISHING

211-L. Mechanized Finishing Gives Tractors Show-Room Gloss. A. A. Stiehl. *American Machinist,* v. 94, Mar. 20, 1950, p. 93-95.

Highly modernized cleaning, painting and baking system. (L26, T21)

212-L. Automatic Spray Painting of Bake Finish on Metal Wall Tile. E. J. Ryser. *Industrial Finishing,* v. 26, Mar. 1950, p. 28-30, 32.

Equipment and procedures. The base consists of Zn-plated steel. (L26, CN, ZN)

213-L. Painting Coil Springs in Centrifugal Machines. Dan Chieger. *In-*

dustrial Finishing, v. 26, Mar. 1950, p. 36-38, 41-42.
(L26, T7)

214-L. Finishing Metal Caskets. L. A. Fletcher. *Industrial Finishing*, v. 26, Mar. 1950, p. 46, 48, 50, 52.
(L general)

215-L. Laying Dutch Metal Leaf on Picture Frame Mouldings. *Industrial Finishing*, v. 26, Mar. 1950, p. 78-80, 83-84.
Highly-skilled technique. "Dutch metal" is an alloy that has the appearance of deep gold. It is hammered or rolled thin to make metal leaf, but it cannot be made as thin as genuine gold. It tarnishes or discolors if exposed to the air; therefore, it must be protected with clear finishing material. (L general)

216-L. Metal Cleaning Problems and Tests for Cleaners. Adolph Bregman. *Metal Progress*, v. 57, Mar. 1950, p. 339-340, 394, 398, 400, 402, 404, 406.
Some cleaning methods and numerous tests used for evaluating the effectiveness of cleaners. (L12)

217-L. Metallizing by High Vacuum. Marvin Schneider. *Modern Plastics*, v. 27, Apr. 1950, p. 135, 138-140.
Various equipment and procedures for applying metal coatings to plastic products. Includes vacuum metallization; silver reduction; and electroplating. (L25)

218-L. Pulsed Current Electroplating: Some New Developments in the Application of Alternating Current to the Plating and Smoothing of Deposits. (Continued.) *Electroplating and Metal Finishing*, v. 3, Mar. 1950, p. 241-243.
Reviews journal literature and patents. (L17)

219-L. Phosphate Treatments for Iron and Steel Surfaces. (Continued.) H. A. Holden. *Electroplating and Metal Finishing*, v. 3, Mar. 1950, p. 244-245, 248.
Concludes survey. (L14, CI, ST)

220-L. Methods for the Protection and Decoration of Aluminium. V. F. Henley. *Electroplating and Metal Finishing*, v. 3, Mar. 1950, p. 248-252.
A survey. (L general, Al)

221-L. Measuring Minute Surface Film. J. G. Donelson. *Modern Packaging*, v. 23, Mar. 1950, p. 125-126.
"Hydrophil Balance" used by U. S. Steel for a quick check of distribution of oil film on tinplate.
(L17, CN, Sn)

222-L. Corrosion Protection by Metallizing. John Wakefield. *Gas Age*, v. 105, Mar. 16, 1950, p. 33-35, 74, 76, 78, 80.
Application of sprayed metal to pipe lines, holders, and compressors. (L23, ST)

223-L. Recent Developments in Heat and Corrosion Resistant Coatings for Tools. Edmund B. Neil. *Tool Engineer*, v. 24, Mar. 1950, p. 34-36.
Hard surfacing, chemical treatments, corrosion resistant and bright deposits, ceramic coatings, and organic coatings. (L general, T6)

224-L. Polishing and Cleaning Metals Prior to Finishing. Edward Engel. *Tool Engineer*, v. 24, Mar. 1950, p. 43-47.
The restrictions and advantages of electropolishing. Metal cleaning and passivation of a number of metals. (L13, L12)

225-L. Hardfacing vs. Abrasion. M. Riddihough. *Welding*, v. 18, Mar. 1950, p. 109-111.
Effect of abrasion upon hard faced earthmoving equipment with emphasis upon the need for selecting different alloys for work on different soils. Methods of deposition of hard metal. (L24, Q9, T4, SG-m)

226-L. When and How To Line Process Vessels With Stainless Steel. R. G. Sloan, Jr. *Chemical Engineering*, v. 57, Mar. 1950, p. 117-121.
When is stainless lining cheaper than stainless-clad or solid stainless? What welding method gives best results for its money? What are the pros and cons of each technique? Answers to these and other key questions on lining with stainless. (L22, K general, T29, SS)

227-L. Metallizing Method of Holder Protection Used at Long Beach, Calif. Arthur Rohman. *American Gas Journal*, v. 172, Mar. 1950, p. 17-18, 46.
Use of sprayed zinc. (L23, CN, ZN)

228-L. Methods of Plating Zinc-Base Die Castings. Robert L. Buckley. *Materials & Methods*, v. 31, Mar. 1950, p. 53-55.
Design, careful surface preparation, and proper choice of plating cycle are all important considerations for successful plating of Ni or Cr on the above. (L17, Zn, Ni, Cr)

229-L. Hard Chromium; Methods of Plating on Aluminium and Its Alloys. K. Gebauer. *Metal Industry*, v. 76, Mar. 10, 1950, p. 186-188.
Previously abstracted from *Archiv für Metallkunde*. See item 8-165, 1949. (L17, Cr, Al)

230-L. Gas-Appliance Users' Demands From the Enameller; Quality Requirements of the Ultimate Customer. E. W. B. Dunning. *Foundry Trade Journal*, v. 88, Mar. 2, 1950, p. 231-237.
Various types of enameling defects, their causes, and remedies. Test procedures. (L27)

231-L. The Painting of Structural Steelwork. *Engineering*, v. 169, Mar. 3, 1950, p. 256.
Results of comprehensive British cooperative investigation conducted since 1945. (L26, T26, CN)

232-L. New Type of Enameling Furnace for Suspended Firing and Vertical Charging Methods. (In German.) W. Kuttler. *Metalloberfläche*, sec. A, v. 4, Feb. 1950, p. 18-21.
Design and operation. Advantages of increased output, and decreased operating cost, repair, and maintenance are claimed. (L27)

233-L. The Value of Clad Metals. (In German.) Werner Engelhardt. *Metalloberfläche*, sec. A, v. 4, Feb. 1950, p. 23-24.
The various commercial uses and respective advantages of clad metals as well as different processes of producing them by adhesion, welding, vapor-deposition, dipping, etc. (L22)

234-L. Avoiding Failures in the Metal Spraying Process. (In German.) H. Reininger. *Metalloberfläche*, sec. B, v. 2, Feb. 1950, p. 22-24.
Recommendations. (L23)

235-L. Effects of Defective Painting on Corrosion Protection. (In German.) K. Würth. *Werkstoffe und Korrosion*, v. 1, Jan. 1950, p. 20-26.
Importance and principles of good painting, and the various types and causes of defective coats of paint. The importance of considering the water and gas permeability of paints and their resistance to external influences. (L26)

236-L. Cleaning Metal Surfaces. (In German.) G. Schultze. *Werkstoffe und Korrosion*, v. 1, Jan. 1950, p. 26-33.
Different cleaning methods. Effectiveness of different inhibitors in preventing corrosion of metals by various media at different temperatures. (L12, R10)

237-L. Properties of the Hard Metals and Their Influence on Production and Use of Tools. (In German.) J. Hinnüber. *Zeitschrift des Vereines Deutscher Ingenieure*, v. 92, Feb. 11, 1950, p. 111-117.
Structures and properties of sintered hard metals, means of application, avoidance of stress cracks, behavior on grinding, etc. 19 ref. (SG-m, EG-d, W, Ti)

238-L. Weld Hard Facing of Tools With Hard Manganese Steel. (In German.) W. Hummitzsch and A. Schmidt. *Schweisstechnik*, v. 4, Jan. 1950, p. 9-11.
Deposition of hard Mn and Cr steels on jaw crushers, hammer mills, and cone crushers by means of arc welding. (L24, T6, AY)

239-L. Hydrogen Embrittlement in Cadmium and Zinc Electroplating. C. A. Zapffe and M. E. Haslem. *Plating*, v. 37, Apr. 1950, p. 366-371.
Embrittlement through hydrogen absorption by the cathode is measured in terms of bend angle sustained by plated wires before fracturing. Both mild steel and stainless steel were studied. Results provide a basis for predicting the scope of the hydrogen problem that might be encountered on changing from one plating operation to another, as well as a quantitative measure of hydrogen injury caused by each of the baths studied.
(L17, Q23, Cd, Zn, CN, SS)

240-L. Adherent Electrodeposits of Nickel on Thin Films of High-Chromium Alloys. Lorn L. Howard. *Plating*, v. 37, Apr. 1950, p. 373-374, 383.
Reviews literature and gives details of procedure developed for depositing Ni on thin films of Cr alloys containing approximately 90% Cr. Such films have certain specialized applications, for instance on piezoelectric quartz plates, to provide suitable mechanical coupling to various sound-transmitting media. 27 ref.
(L17, Ni, Cr)

241-L. Some Modern Methods of Surface Preparation Before Plating. W. A. Corse. *Plating*, v. 37, Apr. 1950, p. 375-377, 383.
Mechanical belt polishing of flat surfaces, manual belt polishing with backstands, and brush-backed polishing. These methods all make use of coated abrasives and produce finishes in the range of 25 micro-inches or less. (L10)

242-L. Plating on Plastics. *Plating*, v. 37, Apr. 1950, p. 384-388.
Equipment and procedures of Plastiplate Co. While Cu is most commonly used, Ag, Ni, Pb, and other metals are also deposited.
(L17, EG-a)

243-L. Determination of Impurities in Electroplating Solutions. XVIII. Traces of Chromium in Copper Plating Baths. Earl J. Serfass, Mary H. Perry, and Sanjoy Sen. *Plating*, v. 37, Apr. 1950, p. 389-393.
Colorimetric methods for determination of chromate Cr and total Cr in Cu plating baths were developed, which are accurate to 5% for Cu concentrations of 6-26 mg. 14 ref.
(L17, S11, Cr, Cu)

244-L. Diamond Abrasives Finish Huge Molds. D. R. Siragusa. *American Machinist*, v. 94, Apr. 3, 1950, p. 124-126.
Procedure used to finish molds for plastic television cabinets—the largest commercial one-piece molding made to date. Crucible CSM-2 tool-steel is used. (L10, T29, TS)

245-L. Palm Trees by Proxy: An Adventure in Research. *Steelways*, v. 6, Mar. 1950, p. 24-25.
Production of tin-plate, with emphasis on use of palm oil. Development of synthetic oil substitute at Armour Research Foundation.
(L17, CN, Sn)

246-L. The Metallising of Non-Metallic Materials. G. T. Colegate. *Ceramics*, v. 2, Mar. 1950, p. 32-36.

Some methods for metallizing of ceramics and similar materials. (L23)

247-L. Cut Wire Shot Lowers Cleaning and Peening Costs. D. A. Cargill. *Iron Age,* v. 165, Apr. 6, 1950, p. 95-97.

Shot is made from carbon steel comparable to SAE 1065 in analysis. By proper balance of heat treating and cold working, wire with tensile strengths over 250,000 psi., hardnesses of Rockwell C-48 to 52, high ductility, and long fatigue life, is produced. New technique using a high-speed rotary-shear principle cuts multiple wires into accurately sized pieces at reasonable cost. In use, the shot quickly becomes spherical. Users report reductions of as much as 50% in peening costs and 30 to 80% in cleaning operations. (L10, G23, T5, CN)

248-L. Heavy Nickel Plating for Salvage; for Corrosion Resistance. P. J. Ritzenthaler. *Iron Age,* v. 165, Apr. 6, 1950, p. 98-101.

Various examples. Savings of over 50% on small pieces and as much as 90% on larger equipment by heavy nickel salvage plating are claimed. Parts requiring corrosion resistance may be made of cast iron or other low-cost material by applying a heavy Ni coat as thick as 0.080 in. (L17, A8, Ni)

249-L. The Performance of Certain Stoving Paints and Other Painting Schemes Used to Protect Steel Sheet Against Atmospheric Corrosion. J. C. Hudson. *Paint Technology,* v. 15, Mar. 1950, p. 101-104.

Results of experiments. Test panels are illustrated. (L26, CN)

250-L. Hard Chrome Plating. Brayton A. Taylor. *Tool Engineer,* v. 24, Apr. 1950, p. C17-C19.

Various applications. (L17, Cr)

251-L. Metallizing Renews Offset Press Cylinders. Elton Sterrett. *Welding Engineer,* v. 35, Apr. 1950, p. 26-27. (L23, T9)

252-L. Black Anodic Finish for Die Cast Aluminum. *Die Castings,* v. 8, Apr. 1950, p. 41-43.

Alumilite process which produces a thin, inert, and durable film of aluminum oxide on the surface which may then be colored by absorption of organic dyes. (L19, Al)

253-L. Conditioning Aluminum Alloys for Electroplating. Fred Keller and Walter G. Zelley. *Journal of the Electrochemical Society,* v. 97, Apr. 1950, p. 143-151.

Various conditioning treatments. Manner in which the treatments and variations in the zinc immersion layer may affect the performance of plated Al alloys. (L17, Al)

254-L. How One Firm Reduced Degreasing and Finishing Costs. W. L. Gwizdowski. *Finish,* v. 7, Apr. 1950, p. 22-23.

Degreasing and finishing layout employing infrared ovens in finishing of electrical-outlet boxes. (L general)

255-L. Titanium Enamel Direct to Titanium Steel. J. B. Simons. *Finish,* v. 7, Apr. 1950, p. 58, 60-61, 67.

Steps in application of enamel. (L27, ST)

256-L. Plastics Combat Well-Head Corrosion in Galveston Bay Fields. J. E. Kastrop. *World Oil,* v. 130, Apr. 1950, p. 162-166.

Use of liquid plastic coatings in mitigation of external well-head corrosion in submerged oil and gas fields where salt-water action is a serious problem. (L26, R4)

257-L. Continuous Strip Pickling. D. Brownlie. *Canadian Metals,* v. 13, Mar. 1950, p. 14, 53.

Equipment. (L12, ST)

258-L. Automatic Control of Plating Operations. Leo Walter. *Machinery* (London), v. 76, Mar. 16, 1950, p. 387-389. (L17)

259-L. Lacquers for Metals; General and Special Applications. E. S. Tonks. *Metal Industry,* v. 76, Mar. 17, 1950, p. 209-211. (L26)

260-L. End Point Indication of the B.N.F. Jet Test for Measurement of Thickness of Cadmium Coatings on Steel. S. G. Clarke and J. F. Andrew. *Journal of the Electrodepositors' Technical Society,* v. 25, 1950, p. 39. (Preprint.)

Results with the solution previously used have occasionally been unsatisfactory because of lack of contrast between the exposed steel and the Cd plate. Describes solution which produces a bright Hg spot at point of exposed steel while surrounding Cd is blackened. (L17, Cd, ST)

261-L. Structure of Electropolished Aluminum Surfaces and Their Oxidation. (In French.) H. Raether. *Métaux & Corrosion,* v. 25, Jan. 1950, p. 1-8.

Studied by electron diffraction. Results are compared with those obtained by measurement of solution potential. 22 ref. (M21, M23, L17, Al)

262-L. Metallization by Aluminum of Industrial Superstructures. (In French.) Maurice Victor. *Revue de l'Aluminium,* v. 27, Jan. 1950, p. 17-19.

Method used by a British firm for automatic continuous grit blasting and aluminum-projection coating of steel girders. (L23, L10, Al, CN)

263-L. Aluminum Coating of Steel. W. C. Reid. *Metal Progress,* v. 57, Apr. 1950, p. 488-489.

Discusses Stroup and Purdy's comparison of costs of various processes (see item 73-L, 1950) intimating that costs of metallizing were improperly represented as being higher than other processes. (L23, Al, CN)

264-L. Titanium Enamel Direct to Steel. F. R. Porter, J. B. Simons, R. F. Bisbee, and C. L. Van Derau. *Better Enameling,* v. 21, Apr. 1950, p. 6-13.

A discussion of the Westinghouse-Inland Steel program. (L27, CN)

265-L. Trouble Shootin'. John L. McLaughlin. *Better Enameling,* v. 21, Apr. 1950, p. 37.

Causes and cures of porcelain-enamel defects known as sagging and scum. (L27, CN)

266-L. Starts Colored Range Output. *Ceramic Industry,* v. 54, Apr. 1950, p. 88-91, 93, 170.

Forming and finishing procedures and equipment of Norge Div. (L27, G1, CN)

267-L. Enamel Process Defects, Causes and Possible Cures. (Concluded.) M. E. McHardy. *Ceramic Industry,* v. 54, Apr. 1950, p. 97, 179.

Causes and cures of various troubles caused by defects in the steel. (L27, CN)

268-L. Enameled Nameplates Require 45 Operations. S. G. Brooks. *Ceramic Industry,* v. 54, Apr. 1950, p. 99.

Procedures of D. L. Auld Co., Columbus, Ohio. A Zn-Cu alloy (5-10% Zn + 90-95% Cu) known as gilder's metal is used almost exclusively. (L27, Cu)

269-L. New Galvanizing Furnace Forms No Dross. Mario Tama. *Iron Age,* v. 165, Apr. 13, 1950, p. 93-96.

Induction-heated, refractory-lined furnace eliminates galvanizer's dross formed by reaction of the container with the molten zinc bath. Close temperature control, absence of fumes, plus better and cheaper coating are claimed. (L16, Zn)

270-L. Electroplated Metals in the Auto Industry. S. E. Sangster. *Products Finishing,* v. 14, Apr. 1950, p. 14-16, 18.

An illustrated survey. (L17, T21)

271-L. Magnesium Processing and Finishing. Gilbert C. Close. *Products Finishing,* v. 14, Apr. 1950, p. 32-34, 36, 38, 40.

Details of new anodic treatment called the Turco-Waterman process which forms a coating of $MgCO_3$ over the metal. Tests indicate superiority over other chemical dip treatments, especially for prevention of sea-water and sea-air corrosion. (L19, Mg)

272-L. Acid Dips for High Carbon and Low Carbon Steel Prior to Electroplating. *Products Finishing,* v. 14, Apr. 1950, p. 52, 54, 56, 58. Based on discussions by R. M. Wick and I. C. Hepfer.

Wick describes recommended procedures to avoid hydrogen embrittlement and to obtain good adhesion to high-carbon steel. Hepfer gives recommendations for low-carbon steel. (L17, L12, CN)

273-L. Progress in Electroplating Uncommon Metals and Alloys. *Products Finishing,* v. 14, Apr. 1950, p. 66, 68, 70, 72, 74.

Review of several papers presented at 96th Electrochemical Society meeting. (L17, EG-b)

274-L. More Rapid Paint Baking Accomplished in All-Metal Infra-Red Heater Installation. *Products Finishing,* v. 14, Apr. 1950, p. 80, 82. (L26)

275-L. High Dross Production in Hot Dip Galvanizing. Wallace G. Imhoff. *Industrial Gas,* v. 27, Apr. 1950, p. 5-6, 25-26, 28.

Ways to reduce dross production by proper furnace design and more uniform heat distribution. (L16, Zn)

276-L. Sherardizing in the Manufacture of Electrical Conduit. A. D. Spillman and J. E. Pittenger. *Industrial Gas,* v. 27, Apr. 1950, p. 7-8.

Process in which a Zn coating is applied to the conduit tubing by rotating in Zn powder in a revolving drum to which heat is applied. During this process the Zn and steel form an alloy and an outer coating which is practically pure Zn. (L16, T1, Zn)

277-L. "Prepolishing" Before Forming. A. H. Allen. *Steel,* v. 126, Apr. 17, 1950, p. 76-77, 94.

Method employed by a leading automotive-parts plant which practically eliminates tedious and expensive hand polishing of steel stampings prior to plating. Steel sheets are prefinished flat, coated with water-soluble plastic, drawn, then cleaned. (L10, ST)

278-L. "Scotch" Tape: New Protective Coating. *Chemical Engineering,* v. 57, Apr. 1950, p. 246, 248, 250.

Use to wrap welded steel joints of gas mains. (L26, ST)

279-L. Recondition Banbury Mixers. H. C. Linde. *Welding Journal,* v. 29, Apr. 1950, p. 325-326.

Hard-facing methods for rubber-mixing equipment. Mixer frames and rotating elements are Grade B cast steel hard faced with stainless electrodes. (L24, T29, CI, SS)

280-L. New Non-Leafing Aluminum Gives the Sparkle Users Demand. G. M. Babcock and F. B. Rethwisch. *Paint, Oil, and Chemical Review,* v. 113, Apr. 13, 1950, p. 23-24.

Production and properties of the various types of Al pigments. (L26, T29, Al)

281-L. Paints on Submerged Steel Structures. *Paint, Oil and Chemical Review,* v. 113, Apr. 13, 1950, p. 63. Translated and condensed from paper by W. Husse, *Farbe & Lack,* v. 55, 1949, p. 441-444.

Bituminous coatings, use of red lead primers under such coatings, and their properties in comparison with chlorinated rubber and benzyl cellulose coatings. (L26, CN)

282-L. Notes on the Formulation of Industrial Finishes for Metal. M. A. Glaser. *Paint, Oil, and Chemical Review*, v. 113, Apr. 13, 1950, p. 37-38, 40, 42, 44, 46, 48, 50, 52-53.

Some of the more important types of industrial finishes. The various components of finishing systems, and the relationship of each component to the whole and to ultimate performance requirements. (L26)

283-L. Surface Treatment and Finishing of Light Metals. Part 5. (Continued.) S. Wernick and R. Pinner. *Sheet Metal Industries*, v. 27, Apr. 1950, p. 355-362.

Various patented chemical oxidation processes, such as the Pylumin, Alrok, Alodine, Alocrom, Jirotka, Pacz, Protal, McCulloch, and two new German (V.A.W.) processes. Applications of these coatings in organic finishing, deposition of Cu on an oxide coating, and treatment of Al alloy castings containing heavy-metal inserts. 21 ref. (To be continued.) (L14, Al)

284-L. Cobalt and Nickel in the Vitreous-Enamelling Industry. J. E. Hansen. *Sheet Metal Industries*, v. 27, Apr. 1950, p. 363-368.

Uses of compounds of Co and Ni for decorative and practical purposes in enameling frits. 28 ref. (L27, T29, Co, Ni)

285-L. Palm Oil Substitutes for Hot Dip Tinning. George E. Ference, W. R. Johnson, L. C. Kinney, and John M. Parks. *Journal of the American Oil Chemists' Society*, v. 27, Apr. 1950, p. 122-127.

Practical requirements, theory of action, screening tests, and development of two potential substitutes—a dimer acid mix and a modified tallow. (L16, Sn, ST)

286-L. Cementiferous Paints. J. E. O. Mayne. *Journal of the Iron and Steel Institute*, v. 164, Mar. 1950, p. 289-293.

Development of paints based on the reaction between Zn dust and certain phosphate solutions. The paints dry by formation of cement, and sufficient metallic Zn is left to afford cathodic protection to steel. They dry at both high and low humidities; are superior to earlier types based on chlorides when applied to both pickled and rusty surfaces; and are cheap and easy to prepare. (L26, ST)

287-L. Plant for Hard Chrome; A Description of French Plating Installations. M. Loiseau. *Metal Industry*, v. 76, Mar. 24, 1950, p. 229-230. Translated from the French. (L17, Cr)

288-L. New Platings Resist Corrosion. J. Lomas. *Machinery Lloyd* (Overseas Edition), v. 22, Apr. 1, 1950, p. 91-93.

New developments in electrodeposited coatings. (L17)

289-L. Concerning Hydrogen Overvoltage. (In French.) Geneviève Sutra. *Comptes Rendus* (France), v. 230, Feb. 13, 1950, p. 644-645; Feb. 20, 1950, p. 749-750.

Discusses reasons for variations of the above dependent on the cathode metal in electrolytic solutions. Suggests that ions adsorbed on the cathode create a power sufficient for extraction at room temperature of metallic electrons. Table shows values of overvoltage and of energy of extraction (thermionic-emission energy) for Pt, Au, Ag, Ni, W. Mo, Sn, Ta, Hg, and graphite. Theoretical basis is discussed. (L17, P15)

290-L. Overvoltage and Electropolishing. (In French.) René Audubert, Maurice Bonnemay, and Eugène Lewartowicz. *Comptes Rendus* (France), v. 230, Feb. 13, 1950, p. 646-648.

Attempts to discover whether or not Audubert's theory of the overvoltage can be applied to electropolishing. Data indicate that, by measurements at different temperatures, it is possible to determine the energies of activation necessary for different processes. (L13)

291-L. Discussion of the Anodic Polishing of Metals. (In German.) K. Huber. *Chimia*, v. 4, Mar. 15, 1950, p. 54-62.

Theory, phenomena, and experiences in electropolishing, properties of electropolished metal surfaces, and analysis of the voltage curves of different electrolytic baths. The distinction between activation and concentration polarization is explained and an example is given of the electropolishing of Zn in NaOH. (L13)

292-L. The Corrosion Resistance of Hard-Chromium Plating. (In German.) Heinz W. Dettner. *Metalloberfläche*, sec. A, v. 4, Mar. 1950, p. 33-37.

Shows experimentally that corrosion resistance depends on the conditions of electroplating and that the lowest corrosion resistance is obtained when the bath temperatures are between 45 and 53° C. Differences in corrosion resistance are explained on the basis of different structural modifications of the deposit. 13 ref. (L17, R general, Cr)

293-L. Experience and Test Results on the High-Luster Nickel Plating of Polished Copper and Brass Parts. (In German.) A. Hofmann. *Metalloberfläche*, sec. B, v. 2, Mar. 1950, p. 38.

Causes of defective plating. (L17, Ni, Cu)

294-L. Electropolishing of Steel. (In German.) Josef Heyes and Wilhelm Anton Fischer. *Metalloberfläche*, sec. A, v. 4, Mar. 1950, p. 38-44.

Reviews the literature and evaluates experimental results of various investigators. 15 ref. (L13, ST)

295-L. (Book) Das Polieren der Metalle: Schleif und Poliertechnik; Handbuch des gesamten Schleif-und Polierwesens. (Polishing of Metals: Abrasion and Polishing Methods; Handbook of All Abrasion and Polishing Methods.) B. Kleinschmidt. 1948. Technischer Verlag Herbert Cram, Berlin, Germany. 14 DM.

A general survey of the polishing of metals. Short accounts of the various abrasives and of the different metals and machines used in these processes. (L10)

M

METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES

117-M. Atomic Diameters of Metallic Elements. Pol Duwez. *Metal Progress*, v. 57, Mar. 1950, p. 348, 348B.

Development of accurate values. Values are represented graphically. (M25)

118-M. Radial Structure of Graphite Nodules. M. Hatherly and L. E. Samuels. *Metal Progress*, v. 57, Mar. 1950, p. 337.

Illustrations show that this structure is strongly apparent only when using polarized light and a prism illuminator. (M21, CI)

119-M. Uranium as a Metallographic Aid. E. H. Rowe. *Metal Progress*, v. 57, Mar. 1950, p. 336.

By spraying the sample or replica in vacuum with a stream of heavy-metal atoms, directed from an oblique angle, the particles or irregularities on the object's surface become coated on one side with the thinnest film of metal, while the areas on the opposite side receive no coating. Hence deep shadows appear on the final photograph. Uranium was found superior to chromium. (M21, U)

120-M. Electron Metallography of Cemented Carbides. William L. Grube. *Metal Progress*, v. 57, Mar. 1950, p. 341-345.

Conventional metallography and details of electron-metallographic techniques. Typical results for tungsten carbide-cobalt compositions. (M21, W, Co, C)

121-M. Room-Temperature Mounting of Metallurgical Specimens. *Technical News Bulletin*, National Bureau of Standards, v. 34, Mar. 1950, p. 31-32.

Simple, inexpensive method for mounting metallurgical specimens at temperatures only slightly above room temperature and without external application of heat. The technique employs a modified acrylic denture material which will polymerize or set under pressure at room temperature. (M21)

122-M. Micro-Radiography Applied to the Study of Iron Ores and Sinters. E. Cohen. *Metallurgia*, v. 41, Feb. 1950, p. 227-233.

Technique for studying distribution of Fe in low-grade British iron ores and sinters. Sample preparation and mounting, nature of ores and sinters, and radiography. (M23, Fe)

123-M. Optical Methods of Determining Grain Orientation in Electrical Sheet Steel. *Metallurgia*, v. 41, Feb. 1950, p. 240.

Two optical methods developed in the B. T. H. Research Laboratory (Britain). (M27, ST)

124-M. On the Interactions of Dislocations and Solute Atoms. B. A. Bilby. *Proceedings of the Physical Society*, v. 63, sec. A, Mar. 1, 1950, p. 191-200.

An extension of the reciprocal theorem of Colonetti is given and with it a general expression derived for the elastic energy of a multiply-connected solid containing sources of internal stress and subjected to external forces. The expression is used to estimate approximately the interaction energy between parallel edge dislocations with arbitrary slip vectors, between parallel screw dislocations, and between an edge dislocation and a solute atom causing a spherical distortion of the lattice. (M26)

125-M. Epitaxial Strain and Disorientation in Crystals Growing on Single-Crystal Substrates. D. M. Evans and H. Wilman. *Proceedings of the Physical Society*, v. 63, sec. A, Mar. 1, 1950, p. 298-299.

Electron-diffraction patterns obtained from a zinc-blende (110) cleavage face after heating in air, constitute the first clear example of rotational slip caused by epitaxial stresses. Extensive rotational slip in a Cu crystal was also demonstrated. (M26)

126-M. The Thermal Etching of Single Crystals of Cadmium. E. N. da C. Andrade and R. F. Y. Randall. *Proceedings of the Physical Society*, v. 63, sec. B, Mar. 1, 1950, p. 198-208.

Heating of single crystal wires of Cd with free evaporation causes formation of crystalline planes. When the basal plane makes a small angle

with the axis of the wire there is a characteristic formation of hexagonal pits, the bottoms of which are mirror-like basal planes; when the basal planes make larger angles, characteristic elliptical traces appear, similar to those formed by mechanical extension. Thermal etching reveals thin laminae in the unstrained wire; the thickness of which is the same as the spacing of the glide planes revealed by mechanical extension. The etched figures, in general, indicate that the substructure revealed by straining is already present in the unstrained crystal. 17 ref. (M27, M26, Cd)

127-M. Microstructure Recordings in Ultra-Short Times Using an X-Ray Flash-Discharge Tube. (In German.) Rudi Schall. *Zeitschrift für angewandte Physik,* v. 2, Feb. 1950, p. 83-88.

Process makes it possible to record microstructural diagrams of monocrystals with exposures of less than ½ μsec. Illustrates the process by investigating the lattice deformation caused by the explosive vaporization of an Al foil supported on a mica plate. (M23, M26)

128-M. Temperature-Composition Diagrams of Metal-Metal Halide Systems. E. D. Eastman, D. C. Cubicciotti, and C. D. Thurmond. "Chemistry and Metallurgy of Miscellaneous Materials—Thermodynamics", Ed. 1, 1950, p. 6-12.

Systems Ba-$BaCl_2$, Ba-$BaBr_2$, Sr-$SrBr_2$, Sr-SrI_2, Ce-$CeCl_3$, Ca-$CaCl_2$ were studied by thermal analysis. In all the systems two components are mutually soluble to a limited extent with a region of immiscibility between. Systems give evidence that no "fog" formation takes place, but that all the metal dissolves in the solution.
(M24, Ba, Sr, Ce, Ca, EG-f)

129-M. An Easy Way To Measure Copper Grain Size. E. W. Schoen. *Iron Age,* v. 165, Apr. 6, 1950, p. 102-103.

How grain size of Cu and Cu alloys may be positively determined with a standard Bausch & Lomb grain-size determination eye-piece such as that ordinarily used for steel. (M27, Cu)

130-M. Specimens Can Be Mounted at Room Temperature. *Iron Age,* v. 165, Apr. 6, 1950, p. 106.

Technique, developed by D. L. Smith, National Bureau of Standards, which employs a denture material of modified acrylic resin as the mounting. The material consists of a polymer and monomer which, when mixed in the proper proportions, will polymerize or set under pressure at room temperature. (M21)

131-M. The Crystal Structures of CeB_4, ThB_4, and UB_4. Allan Zalkin and D. H. Templeton. *Journal of Chemical Physics,* v. 18, Mar. 1950, p. 391.

Previously abstracted from *U. S. Atomic Energy Commission,* AECD-2762. See item 112-M, 1950.
(M26, Ce, Th, U)

132-M. Static Models of Dislocations. B. A. Bilby. *Journal of the Institute of Metals,* v. 76, Feb. 1950, p. 613-627.

Describes and illustrates a model with which various crystal lattices can be built. These can be deformed elastically and dislocations introduced. With this model, geometry of the motion and arrangement of dislocations of various types, and certain results of the elastic theory of dislocations, can be demonstrated. Examples of dislocations in a simple cubic lattice. 18 ref. (M26)

133-M. Note on the Use of Electropolishing in the Metallographic Study of Plastic Deformation. G. R. Wilms. *Journal of the Institute of Metals,* v. 76, Feb. 1950, p. 629-630.

Attention is drawn to some misleading observations that may be made if anodic films are not removed from the electropolished specimens. (M21, Q24)

134-M. The Structure of Eutectics. E. C. Ellwood and K. Q. Bagley. *Journal of the Institute of Metals,* v. 76, Feb. 1950, p. 631-642.

Crystal structures of four binary alloys, Ag-Cu, Al-Cu, Ag-Al, and Fe-cementite, each of which consists at room temperature of a two-phase system in which the phases were formed simultaneously at a higher temperature, were studied. It was found that a single crystal of eutectic acts, with logical exceptions, as a combination of two interlacing single crystals—one from each phase—and that the phases are aligned in such a manner as to cause least interference at the crystal interface. Possible effect of crystal structure and similarity of atomic spacing on solid solubility. 11 ref.
(M26, Ag, Al, Cu, Fe)

135-M. Electrolytic Polishing of Titanium. D. A. Sutcliffe, J. I. M. Forsyth, and J. A. Reynolds. *Metallurgia,* v. 41, Mar. 1950, p. 283-284.

Titanium may be satisfactorily electropolished by making it the anode of a cell containing a mixture of acetic and perchloric acids, using a Ti-plate cathode and a current density of 30-40 amp. per sq. dm. A feature of the method is the short time required to obtain a scratch-free surface. (M21, L13, Ti)

136-M. The Specific Energy of Crystal Boundaries in Tin. K. T. Aust and B. Chalmers. *Proceedings of the Royal Society,* ser. A, v. 201, Mar. 22, 1950, p. 210-215.

Three tin crystals of predetermined orientations were prepared with various differences of orientation between two of the crystals. Equilibrium angles between the three boundaries were measured. Relative values of specific surface free energy were deduced from the angles, and it was found that surface energy decreases progressively as the difference of orientation decreases below about 6°. The result is believed to provide strong support for the "transitional lattice" theory. (M26, Sn)

137-M. Micrographic Study of Solidification Structures of 99.5% Pure Aluminum. (Heterogeneous Structure.) (In French.) J. Hérenguel. *Revue de Métallurgie,* v. 47, Jan. 1950, p. 29-38; discussion, p. 38.

Results of experimental investigation, including numerous micrographs. Study of causes of localization of attack as shown by corrosion or etching patterns. Effects of added metals more electropositive than Al (Cu, Si, Fe) and more electronegative (Mg) on the latter. Relationship between localized attack and other micrographic observations. (M27, R1, Al)

138-M. Thermal Polishing and Etching of Nickel. Glen W. Wensch. *Metal Progress,* v. 57, Apr. 1950, p. 488.

During some experiments it was noted that the surfaces of nickel specimens became polished and etched during a long anneal when sealed in quartz tubes. The polishing and etching is the result of evaporation of metal from the surface of the specimen. The phenomenon may provide a feasible method for obtaining metallographic data concerning high-temperature allotropic phases. (M21, Ni)

139-M. Rapid Production of Small Metal Particles. G. F. Tisinai and R. B. Hendry. *Metal Progress,* v. 57, Apr. 1950, p. 490.

For production of particles used in X-ray powder-diffraction work, a small power hacksaw is converted into a filing machine by replacing the hacksaw blade with a jig for holding the file. (M22)

140-M. The Determination of the Texture of Rolled Sheet From X-Ray Diffraction Photographs. A. E. De Barr and B. Roberts. *Journal of the Iron and Steel Institute,* v. 164, Mar. 1950, p. 285-287.

Method by which full information on the above can be obtained from only 3 or 4 photographs. Illustrated with reference to rolled iron sheet, but may be applied to other materials. Advantages over usual procedure for construction of pole figures. (M22, Fe)

141-M. The Ternary Lead-Lead Sulfide-Tin-Tin Sulfide System. (In German.) Rudolf Vogel and Anton Zastera. *Zeitschrift für Metallkunde,* v. 41, Jan. 1950, p. 14-19.

A redetermination of the PbS-SnS system showed that a PbS-SnS compound does not exist, as was previously supposed. A slightly greater affinity of sulfur for Sn than for Pb is indicated. 7 ref.
(M24, Pb, Zn)

142-M. The Manganese-Phosphorus System. (In German.) Josef Berak and Theo Heumann. *Zeitschrift für Metallkunde,* v. 41, Jan. 1950, p. 19-23.

Experiments made to redetermine the Mn-P system revealed the compounds Mn_2P and MnP and two peritectic phases Mn_3P and Mn_3P_2. 15 ref. (M24, Mn, P)

143-M. Microscopic Observation of the Decomposition of Mg_7Zn_3 Crystals. (In German.) Werner Köster. *Zeitschrift für Metallkunde,* v. 41, Feb. 1950, p. 37-39.

Mg_7Zn_3 crystallizes near the melting point of the alloy, but the crystals are stable only within a range of about 10° C.; and they decompose at 330° C. into Mg solid solution and Mg_3Zn_2. Includes constitution and numerous photomicrographs.
(M26, Mg, Zn)

144-M. Several Problems in the Physics and Chemistry of the "Semimetals" and "Metametals". (In German.) W. Klemm. *Angewandte Chemie,* v. 62, Mar. 21, 1950, p. 133-142.

Proposes that the elements be classified into true metals, metametals, semimetals (metalloids) and nonmetals. Physical and chemical characteristics of the semi- and metametals and their behavior towards each other and towards other elements. Includes constitution diagrams of alloys and compounds.
(M24, EG-j)

145-M. Crystal Structure of $PtSn_4$. (In German.) Konrad Schubert and Ulrich Rösler. *Zeitschrift für Naturforschung,* v. 5a, Feb. 1950, p. 127.

Results of determination of lattice dimensions and structures.
(M26, Pt, Sn)

146-M. Electropolishing; Adaptation to Metallography. (In Dutch.) A. L. De Sy and H. Haemers. *Metalen,* v. 4, Mar. 1950, p. 129-137.

An illustrated review. 20 ref.
(M21)

147-M. (Book) Equilibrium Data for Tin Alloys. L. T. Greenfield and J. S. Bowden. 60 pages. Tin Research Institute, Fraser Road, Greenford, Middlesex, England. (U. S. office: 492 W. 6th Ave., Columbus 1, Ohio.) 2s., 6d. (50c)

Replaces an earlier publication by E. S. Hedges and C. E. Homer. The diagrams are presented in a more convenient form, a single diagram now being given for each system. Interpretation is facilitated by introduction of temperature and composition coordinates, and confusion is avoided by printing the coordinates in color. Additions have been made to the earlier list of binary alloy

systems. Supplementary explanatory notes are appended to many of the diagrams and, where available, information on crystal structure is given. A bibliography of publications on ternary Sn alloy systems is included. (M24, Sn)

N

TRANSFORMATIONS AND RESULTING STRUCTURES

79-N. Research on the Electrodeposition of Alloys. II. Structure of the Products. (In Italian.) Vincenzo Montoro. *Metallurgia Italiana*, v. 41, Nov.-Dec. 1949, p. 279-286.

Studied for Cu-Sn alloy deposits containing 51.5, 61.2, 62.0 and 62.3% Sn, by X-ray diffraction. Characteristics of supersaturated solid solutions present in the electrodeposits are defined. 23 ref. (N12, L17, Sn)

80-N. Basic Structure of the K-Absorption Edges of Transition-Element Atoms in Metals. (In Russian.) E. Vainshtein. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 70, Jan. 1, 1950, p. 21-23.

Theoretical investigation indicates that the attempts of Beeman and Friedman to interpret the above structure result in disagreement with experimental data. Proposes a new interpretation which agrees quite closely with such data. (N11)

81-N. Structural Changes During Aging of Aluminum Containing 2% Copper. (In Russian.) M. I. Zakharova. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 70, Jan. 1, 1950, p. 55-56.

Dissociation of the above solid solution was investigated by means of X-ray diffraction, using monocrystals grown by recrystallization. (N7, Al)

82-N. On the Growth of Metallic Crystals From the Vapor Phase. George R. Keepin, Jr. *Journal of Applied Physics*, v. 21, Mar. 1950, p. 260-261.

Effects of various procedural and environmental changes on growth of Cd and Zn crystals from the vapor. (N15, Cd, Zn)

83-N. The Thermal Stabilization and Sintering of Gold Smoke Deposits. Louis Harris, David Jeffries, and Benjamin M. Siegel. *Journal of Chemical Physics*, v. 18, Mar. 1950, p. 261-265.

Gold smokes made by evaporation in an inert gas atmosphere are initially in a thermodynamically unstable state. A theory based on diffusion of vacant sites to the surface of the crystallites was developed to describe the process by which the deposit approaches equilibrium. Measurement at different temperatures of the change of resistance associated with the loss of vacant sites was made. When heated above 100° C., the deposits sinter rapidly and undergo pronounced changes in optical properties. However, a gold smoke can be stabilized by heat treatment at 70° C. so that sintering proceeds at an appreciably lower rate. 12 ref. (N15, H15, Au)

84-N. Spacings of Retained Austenite in Quenched White Cast Iron. W. J. Wrazej. *Nature*, v. 165, Mar. 18, 1950, p. 447-448.

To provide a comparison between estimated parameters of retained austenite in samples of high-carbon steel with those of samples that have, after heating, retained a sufficient quantity of carbon, a white cast iron was chosen in which the total amount of alloying elements was less than 1%, that is, similar in quality and quantity to those in mild plain-carbon steels. Samples in the form of flat lumps were quenched from a series of A_c temperatures, then polished and examined both microscopically and by X-rays. (N8, CI)

85-N. A General Literature Survey of Diffusion in Metals. R. O. Hutchison. *U. S. Atomic Energy Commission, AECU 401*, June 10, 1949, 36 pages.

Informative abstracts referring to the more prominent literature on the subject. The articles are abstracted according to their usefulness in an investigation carried out by the author.

86-N. Micrographic Confirmation of the Reversibility of the Transformation Associated With Annealing Brittleness of Steels Having Low Nickel and Chromium Contents. (In French.) Pierre A. Jacquet. *Comptes Rendus* (France), v. 230, Feb. 13, 1950, p. 650-651.

Structural changes associated with this reversibility of transformation in steels containing 0.30% C, 3.25% Ni, and 1.65% Cr were investigated. Analysis of the micrographs explains the well-known scattering of the impact-strength values of specimens treated under identical conditions and the influences of very slight variations of annealing conditions on impact strength and transition temperature. (N8, Q23, Q6, AY)

87-N. X-Ray Study of Annealing Brittleness of Steel Having Low Nickel and Chromium Contents. (In French.) Adrienne R. Weill. *Comptes Rendus* (France), v. 230, Feb. 13, 1950, p. 652-654.

Investigation using X-ray diffraction and electropolished specimens used by Jacquet (see item 86-N above) indicate that atoms of the element responsible for brittleness dissolve in the ferrite network during annealing, causing marked internal distortions. (N8, Q23, AY)

88-N. Study by Means of Microhardness Determination of the Multiphase Diffusion of Beryllium Into Very Pure Aluminum. (In French.) Helmut Bückle and Jacques Descamps. *Comptes Rendus* (France), v. 230, Feb. 20, 1950, p. 752-754.

Sheets of very pure Al and Al-Be alloy (1.06% Be) were mechanically and electrolytically polished, then welded together. These specimens were maintained at a series of constant elevated temperatures for 1-25 days, aged at 100° C. for 1 hr., then quenched in water. Diffusion results are revealed by microhardness determinations. (N1, Q29, Al, Be)

89-N. Reorientation as an Example of Oriented Atom Distribution. (In German.) Otto Dahl. *Zeitschrift für Metallkunde*, v. 41, Jan. 1950, p. 8-9.

Effect of degree and time of heat treating on electrical resistance of $AuCu_3$ was determined. Shows that formation of a superlattice results in basically the same type of reorientation curves as the ones obtained with age-hardenable alloys. (N10, Au, Cu)

90-N. Growth Processes in Zinc and Cadmium Single Crystals. (In German.) Arend Eisenloeffel and Iwan N. Stranski. *Zeitschrift für Metallkunde*, v. 41, Jan. 1950, p. 10-13.

Experiments to study the formation of metallic single crystals from the melt and their growth in the vapor phase. An explanation is given for the formation of surface and bulk structures. (N12, Zn, Cd)

91-N. The Law of Corresponding Recovery Conditions. (In German.) Kurt Lücke. *Zeitschrift für Metallkunde*, v. 41, Feb. 1950, p. 40-41.

Limitations of the above law for the recovery of lattice distortions of cold worked metals. Measurements of the changes of electrical resistance of copper wire on recovery prove validity of the law for this case. (N4)

92-N. The Thermodynamics of Age-Hardening of Systems With Negative Heats of Solution. (In German.) Erich Scheil. *Zeitschrift für Metallkunde*, v. 41, Feb. 1950, p. 41-45.

Shows that the theory of regular solid-solution phases fails in the case of solid solutions with negative heats of solution. The single-phase precipitation of such solid solutions can be explained by expansion of Wagner and Schottky's ideal defective-orientation theory. This theory also furnishes a method of calculating constitution diagrams with orientation phases and areas of segregation. 12 ref. (N7)

93-N. Hardening and Softening of Age-Hardenable Aluminum Alloys by Heat Treatment and Working. (In German.) Gunter Wassermann. *Zeitschrift für Metallkunde*, v. 41, Feb. 1950, p. 50-55.

Al-Cu, Al-Cu-Mg, and Al-Cu-Mg alloys containing about 95% Al were investigated. Experiments made by rolling sheet metal at stated intervals of aging show that the hardening effect of the rolling operation steadily decreases the longer the alloys have been age-hardened. The Fraenkel effect on specimens that have been age-hardened, cold rolled, and again heat treated at the original temperature of age-hardening is explained. (N7, Al)

94-N. Electrocrystallization of Metals. (In Russian.) V. V. Gikhailov. *Uspekhi Khimii* (Progress in Chemistry), v. 18, Nov.-Dec. 1949, p. 724-736.

Formation and growth of crystals during electrolysis. Influence of different factors, such as concentration of solution and current density on rate of nucleation and rate of crystal growth. 53 ref. (N12)

P

PHYSICAL PROPERTIES AND TEST METHODS

105-P. Correlation of Geiger Counter and Hall Effect Measurements in Alloys Containing Germanium and Radioactive Antimony 124. G. L. Pearson, J. D. Struthers, and H. C. Theuerer. *Physical Review*, ser. 2, v. 77, Mar. 15, 1950, p. 809-813.

Distribution of the solute atoms in ingots of Ge-Sb alloys prepared according to a prescribed cooling cycle was measured. The solute was Sb^{124} and its distribution was measured with a Geiger counter. In addition, Hall measurements were made which show that in the impurity-saturation range each antimony atom contributes one conduction electron. This makes it possible to determine the solute distribution in non-radioactive samples by the Hall method. (P15, Ge)

106-P. Theory of Magnetic Properties and Nucleation in Alnico V. C. Kittel, E. A. Nesbitt, and W. Shockley. *Physical Review*, ser. 2, v. 77, Mar. 15, 1950, p. 839-840.

Alnico V is a permanent-magnet alloy containing 8% Al, 14% Ni, 24% Co, 3% Cu, and 51% Fe by weight,

with the unique property among conventional magnet alloys that the energy product $(BH)_{max.}$ is increased by heat treatment in a magnetic field. A means whereby magnetic effects may control nucleation and produce the observed anisotropy and other properties is outlined.
(P16, N2, SG-n)

107-P. Coercive Force Vs. Temperature in an Alloy With Zero Crystalline Magnetic Anisotropy. J. K. Galt. *Physical Review,* ser. 2, v. 77, Mar. 15, 1950, p. 845-846.

Results of measurements of coercive force of a powder containing 68% Ni and 32% Fe at various temperatures between −200 and +400° C. (P16, Ni)

108-P. The Effect of Electronic Paramagnetism on Nuclear Magnetic Resonance Frequencies in Metals. C. H. Townes and W. D. Knight. *Physical Review,* ser. 2, v. 77, Mar. 15, 1950, p. 852-853.

The nuclear paramagnetic resonance frequency for an atom in the metallic state usually is appreciably greater than the resonance frequency when the atom is in a nonmetallic compound. These frequency shifts are too large to be caused by differences in magnetic susceptibility in diamagnetic correction. Proposes that they are primarily due to orientation by the magnetic field of the spins of conduction electrons near the top of the Fermi distribution, and the interaction of these electrons with the nuclei. (P16)

109-P. Kinetics of the Phase Transition in Superconductors. A. B. Pippard. *Philosophical Magazine,* ser. 7, v. 41, Mar. 1950, p. 243-255.

A study was made of the influence of electromagnetic effects on the speed at which transition can occur between normal and superconducting states of a metal in a magnetic field, and it is concluded that these are powerful enough to be the dominant factor determining speed. Illustrative examples include transition of a superconducting plane slab and cylinder in a field greater than critical, destruction of superconductivity in a wire by means of a current, and mechanism of establishment of the intermediate state. (P15)

110-P. The Magneto-Resistance of the Alkali Metals. D. K. C. MacDonald. *Proceedings of the Physical Society,* v. 63, sec. A, Mar. 1, 1950, p. 290-292.

The magneto-resistive effect was examined experimentally in the alkali metals at low temperatures. It was concluded that deviations from the free electron gas model become considerable in the case of the heavier metals, cesium and rubidium.
(P16, EG-e, Ce, Rb)

111-P. Variations in the Resistance of Tin and Indium in a Magnetic Field. (In Russian.) E. S. Borovik. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 69, Dec. 21, 1949, p. 767-769.

Investigated at temperatures below 4.2° K. The irregular variation of resistance with increasing magnetic field at these low temperatures is similar to that observed for Bi and Zn by other investigators. Evidence indicates that the periodic dependence of resistance on magnetic field is a property possessed by all metals under similar conditions.
(P16, Sn, In)

112-P. Magnetic Properties of Tin at Low Temperatures. (In Russian.) B. I. Verkin, B. G. Lazarev, and N. S. Rudenko. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 69, Dec. 21, 1949, p. 773-776.

Method of investigation on Sn monocrystals at temperatures of liquid hydrogen and helium. 10 ref. (P16, Sn)

113-P. The Thermodynamic and Physical Properties of the Elements. Leo Brewer. "Chemistry and Metallurgy of Miscellaneous Materials—Thermodynamics", Ed. 1, 1950, p. 13-39.

Tables of heat contents, vapor pressures, heats of vaporization, and entropies of vaporization for 60 elements prepared from data collected from the literature. 106 ref. (P12)

114-P. Thermodynamic and Physical Properties of Nitrides, Carbides, Sulfides, Silicides, and Phosphides. L. Brewer, L. A. Bromley, P. W. Gilles, and N. L. Lofgren. "Chemistry and Metallurgy of Miscellaneous Materials—Thermodynamics", Ed. 1, 1950, p. 40-59.

Free energies, heats, and entropies of formation at 298° K. are tabulated for many nitrides, carbides, and sulfides; melting temperatures and solubilities in water and acid are given for those and for silicides, phosphides, and borides. Includes a table of stable gaseous compounds at 1500, 2000, and 2500° K. and 10^{-3} to 10^{-5} mm. Hg; and a table of all possible refractory nitrides, carbides, and sulfides for the same temperature and pressure range. Volatilities, and application to construction of high-temperature, high-vacuum systems. 64 ref. (P12, B19, SG-h)

115-P. Thermal Expansion Characteristics of Stainless Steels Between −300° and 1000° F. D. E. Furman. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, Apr. 1950, p. 688-691.

Determined for types 301, 304, 316, 347, 310, and 330 steels. Results provide insight into the effects of austenite stability and alloy content on expansion characteristics. (P11, SS)

116-P. Chromium-Carbon Relation in High Chromium Steels. *Industrial Heating,* v. 17, Mar. 1950, p. 510-511. Condensed from paper by D. C. Hilty.

Previously abstracted from *Electric Furnace Steel Proceedings.* See item 2B-353, 1949. (P12, D5, AY)

117-P. Cathodic Evolution of Hydrogen at Very High Current Densities. A. M. Azzam and J. O'M. Bockris. *Nature,* v. 165, Mar. 11, 1950, p. 403-404.

In the work reported heating effects and concentration overvoltages were eliminated by utilizing a very rapid flow rate (20-22 meters per sec.) of the solution over a wire electrode in a constriction; and electrode area was of the order of 0.01 sq. cm. It was found possible to apply direct measurement up to 150 amp. per sq. cm. Results for mercury, tungsten, silver, platinum, palladium, and nickel.
(P15, EG-a)

118-P. Superconductivity of Uranium. B. B. Goodman and D. Shoenberg. *Nature,* v. 165, Mar. 18, 1950, p. 441-442.

New results which indicate that uranium is a superconductor, but has different transition temperatures according to purity of the specimen.
(P15, U)

119-P. The Effect of Cold Working on the Electrical Resistivity of Copper and Aluminum. J. W. Rutter and James Reekie. *Physical Review,* ser. 2, v. 78, Apr. 1, 1950, p. 70-71.

Experimental results on highly pure material. (P15, Cu, Al)

120-P. Apparent Permeability and Overvoltage Factor of Magnetic Powders. (In French.) Antoine Colombani. *Comptes Rendus* (France), v. 230, Feb. 6, 1950, p. 523-525.

Derives formulas and interprets them for different values of the variables. Results are said to agree well with experimental data. (P16)

121-P. Dilatometers for Determination of Magnetostriction by Volume and by Length. (In French.) Roger Vautier. *Journal des Recherches du Centre National de la Recherche Scientifique,* no. 10, 1950, p. 23-27.

Structural details and technique of operation. (P16)

122-P. Internal Demagnetization Factors of Highly Coercive Alloys. (In Russian.) N. V. Balgakov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 70, Jan. 11, 1950, p. 205-206.

Investigated for "Alni", "Alnico", and "Magnico" alloys, cooled from a temperature above the Curie point in a magnetic field. Ten specimens differently heat treated were tested. (P16, SG-n)

123-P. The Stability and Chemical Reactivity of Titanium Nitride and Titanium Carbide. F. H. Pollard and P. Woodward. *Transactions of the Faraday Society,* v. 46, Mar. 1950, p. 190-199.

Titanium nitride was found to undergo second-order decomposition in vacuum at 1000° C. and above. Reactions of both nitride and carbide with various gases were studied at 1200° C. (P13, Ti)

124-P. Variations of Curie Points of Palladium-Base Paramagnetic Alloys. (In French.) Jules Wucher. *Comptes Rendus* (France), v. 230, Feb. 20, 1950, p. 730-732.

Charted for alloys of Pd with Cu, Ag, Au, Al, Sn, Pb, Sb and Ga, as a function of "electron concentration" obtained by multiplying atomic concentration of the added element by its valence in the given alloy. Shows that Curie points of the Pd-base alloys are a function of electron concentration. (P16, Pd)

125-P. Surface Conductivity of Germanium. (In French.) Pierre Aigrain. *Comptes Rendus* (France), v. 230, Feb. 20, 1950, p. 732-733.

Method for measuring conductivity of germanium used in high-voltage rectifiers. Analysis of tabulated data indicates that, at high voltages, the theoretical law is not observed because of the increase of local temperature. A correction method for such cases is proposed.
(P15, T1, Ge)

126-P. Peltier Effect on Monometallic Contacts. (In German.) Isolde Dietrich. *Zeitschrift für angewandte Physik,* v. 2, Mar. 1, 1950, p. 128-131.

It was experimentally established that the inverse effect (which is analogous to the Peltier effect) of the thermal potential at the contact cannot be observed when the contact is coated with a thin film of foreign matter. Effect of temperature of the contact on Peltier effect and Thomson effect as well as Peltier coefficient for Au and Pt were determined.
(P15, Au, Pt)

127-P. (Book) The Chemistry and Metallurgy of Miscellaneous Materials—Thermodynamics. Ed. 1. Laurence L. Quill, editor. 329 pages. 1950. McGraw-Hill Book Co., 330 West 42nd St., New York 18. $3.00.

Papers by various authors which deal with liquid-solid equilibria, temperature-composition diagrams, thermodynamic and physical properties of elements, nitrides, carbides, sulfides, silicides, phosphides, gases, and halides. Papers concerning metals are abstracted separately. (P12)

New Classification System for Metal Literature Review
See page 4 for details

Q

MECHANICAL PROPERTIES AND TEST METHODS; DEFORMATION

201-Q. Strain Gage Reading at a Glance. *Aviation Week,* v. 52, Mar. 27, 1950, p. 34-35.

Apparatus constructed in England for testing aircraft structures which automatically accepts and displays in rapid succession readings from any number of strain gages. (Q25)

202-Q. The Part of Octahedral Theory in the Study of the Plasticity of Metals. Wendell P. Roop. *Journal of the Franklin Institute,* v. 249, Mar. 1950, p. 223-236.

Somewhat simplified explanation clarified by diagrams. 17 ref. (Q23)

203-Q. Test Bar Results Compared With Tests on Components. A. L. Boegehold. *Metal Progress,* v. 57, Mar. 1950, p. 349-357.

Presents evidence that residual stress is a major cause of the difference between test-bar results and tests on components made from heat treated steel. Indicates need for a large amount of information concerning the relation of hardenability, section size, quenching severity, and tempering procedure to magnitude and direction of residual stress. (Q25, J26, ST)

204-Q. Russian Opinions on Evaluation of Metals by Mechanical Tests. E. P. Klier. *Metal Progress,* v. 57, Mar. 1950, p. 358-359, 372, 374-375. Based on article in *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, 1948, p. 446-486.

Results of a survey of opinions of Russian experts on the general character of mechanical properties, evaluation of the structural behavior of materials as a result of mechanical tests, evaluation of fabrication characteristics as a result of mechanical tests, and quality control. Replies of eight individuals are digested. (Q general)

205-Q. Fundamental Mechanical Properties. *Metal Progress,* v. 57, Mar. 1950, p. 407-409. Translated and condensed.

Previously abstracted from "What Are the Fundamental Properties Necessary to Describe the Mechanical Properties of Materials?", Carl Benedicks. *Revue de Métallurgie.* See item 3A-92, 1949. (Q general)

206-Q. Creep of Ingot Iron. *Technical News Bulletin* (National Bureau of Standards), v. 34, Mar. 1950, p. 34-35.

See abstract of "Influence of Strain Rate and Temperature on the Creep of Cold-Drawn Ingot Iron", William D. Jenkins and Thomas G. Digges, *Journal of Research of the National Bureau of Standards,* item 3B-220, 1949. (Q3, Fe)

207-Q. Fundamentals of the Working of Metals. Part IX. The Transformation From the Ingot to the Wrought Product—Mechanical Directionality. George Sachs. *Modern Industrial Press,* v. 12, Mar. 1950, p. 6, 8, 42.

Effects of working with respect to differences between mechanical properties measured in different directions. (Q24)

208-Q. The Static Coefficient of Friction and the Area of Contact. R. C. Parker and D. Hatch. *Proceedings of the Physical Society,* v. 63, sec. B, Mar. 1, 1950, p. 185-197.

Apparatus for measuring the coefficient in which the forces tending to disturb the contact area are minimized and which enables the contact area to be viewed throughout the experiment. Surface examination by means of an electron microscope gave results in accord with a cohesive theory of friction, and offer no support for the theory involving formation of welded junctions. 30 ref. (Q9)

209-Q. Properties of Steels Commonly Used for Plastic Molds. *Materials & Methods,* v. 31, Mar. 1950, p. 81.

Qualitative information in tabular form on method of making cavity, type of mold for which suitable, method of hardening, distortion in hardening, hobability, machinability, core strength, case hardness, and wear resistance for a low-carbon and five low-alloy steels. (T5, J28, G17, Q9, T5)

210-Q. Frictional Properties of Porous Metal Impregnated With Plastic. F. P. Bowden. *Research,* v. 3, Mar. 1950, p. 147-148.

Sintered Cu was impregnated with Teflon, giving remarkably low values of friction, which were maintained up to 250-300° C. (Q9, H16, Cu)

211-Q. Methods of Evaluating Hot Malleability of Nickel and High-Nickel Alloys. L. H. Martin and L. O. Bieber. *American Institute of Mining and Metallurgical Engineers,* Institute of Metals Div., Symposium Series, Vol. 2, "Nonferrous Rolling Practice", 1948, p. 15-28; discussion, p. 28-31.

Preparation of test specimens, hot bend tests, hot compression tests, and hot-malleability tests vs. rolling results. Compares various test methods. (Q23, F23, Ni)

212-Q. The Measurement of the Coefficient of Internal Friction of Solid Rods by a Resonance Method. W. Lethersich and H. Pelzer. *British Journal of Applied Physics,* v. 1, Jan. 1950, p. 18-22.

Gives theory and derives expression relating amplitude of vibration to frequency for a rod subjected to alternating mechanical stress. The coefficient of internal friction of the material can be deduced if it is small as, for example, with metals. Physical basis from which the fundamental equations are derived, and the relation between longitudinal and tangential viscosity. (Q22)

213-Q. Improvements in Photo-Elastic Technique Obtained by the Use of a Photometric Method. A. F. C. Brown and V. M. Hickson. *British Journal of Applied Physics,* v. 1, Feb. 1950, p. 39-44.

Photo-electric photometer adapted for use in photo-elasticity. Sensitivity of the instrument is such that a photo-elastic stress pattern can be measured to within ± 1/500 fringe. Resultant improvements in technique. Apparatus, examples of its use, and factors limiting its accuracy. (Q25)

214-Q. Elastico-Plastic Straining When the Principal Stresses Rotate. K. H. Swainger. *Nature,* v. 165, Mar. 4, 1950, p. 360-361.

Theoretical controversy concerning method of analysis of post-yield straining of metals. (Q25)

215-Q. Meyer Analysis of Metals. Hugh O'Neill. *Nature,* v. 165, Mar. 4, 1950, p. 362.

Variation of ultimate hardness number with Meyer index in the ball indentation test. Several good reasons for associating a decrease in Meyer index with a decrease in work hardening capacity of the metal. However, results were obtained where the Meyer index to the pyramid indentation increased with cold working as compared with a fall in the normal ball test. (Q29)

216-Q. Creep and Fatigue Tests on Commercially Extruded Lead and Lead Alloy Pipes. (Continued.) J. McKeown and L. M. T. Hopkin. *Metallurgia,* v. 41, Feb. 1950, p. 219-223.

Investigation to determine the degree of reproducibility to be expected from materials produced by extrusion on commercial presses. Effect of cold work on Tadanac lead from the pipe press, on alloy of 0.005% Ag + 0.005% Cu, and on 0.015% Te lead. Effect of heat treatment on Tadanac lead from the pipe press. Fatigue tests and results. (Q3, Q7, Pb)

217-Q. 1,000-Ton Testing Machine for Structures. *Engineering,* v. 169, Feb. 24, 1950, p. 207-209; Mar. 3, 1950, p. 237-239.

British equipment intended for fundamental research into the structural components of aircraft. Dimensions were chosen to permit the testing of large sections under compression and tension. (Q27, Q28)

218-Q. The Importance of Surface Oxide Films in the Friction and Lubrication of Metals. Part I. The Dry Friction of Surfaces Freshly Exposed to Air. Part II. The Formation of Lubricating Films on Metal Surfaces. E. D. Tingle. *Transactions of the Faraday Society,* v. 46, Feb. 1950, p. 93-102.

A new "cutting" technique of surface preparation is used to demonstrate effect of the surface oxide film on friction and lubrication of metals. Experiments with lubricated surfaces emphasize the importance of chemical attack in boundary lubrication by fatty acids and demonstrate the essential part played by the oxide film in formation of the lubricating layer. On the basis of the results, lubricating properties of long-chain fatty acids on three main classes of metals are explained. 22 ref. (Q9)

219-Q. Production Quality Control. (In Italian.) Carlo Sapegno. *Metallurgia Italiana,* v. 41, Nov.-Dec. 1949, p. 271-278.

System for steel production based on mechanical-test results on test bars cut from a 150-kg. ingot obtained at the midpoint of the pouring step, and rolled into billets; also on microscopic examination of cross sections of the same sample. Two quality indexes are based on these tests. (Q general, S12, ST)

220-Q. The Use of Surface Pressure in the Clamping of Fatigue Test Bars. (In German.) G. Denkhaus. *Metalloberfläche,* sec. A, v. 4, Feb. 1950, p. 17.

Improved clamping arrangement. (Q7)

221-Q. Visual Strain-Recorder. *Aircraft Production,* v. 12, Apr. 1950, p. 131-132.

New airspeed polygraph equipment which displays information on a large screen. (Q25)

222-Q. Creep Testing Cold Drawn Ingot Iron. *Steel,* v. 126, Apr. 10, 1950, p. 88-90.

Recent studies at National Bureau of Standards which reveal that resistance to fracture increases with an increase in the strain rate. Resistance to creep increased as test temperature decreased. (Q3, Fe)

223-Q. How Metals Fracture. *Product Engineering,* v. 21, Apr. 1950, p. 145-146. Condensed from "The Fracture of Metals", C. F. Tipper.

Previously abstracted from *Metallurgia.* See item 3B-20, 1949. (Q26)

224-Q. New Laboratory Studies Creep and Stress-Rupture. *Industry and Power,* v. 58, Apr. 1950, p. 103-104.

New testing laboratory of Babcock & Wilcox. (Q3, Q4, A9)

225-Q. Six Advantages of Scratch Hardness Testing. John H. Hruska. *Welding Engineer,* v. 35, Apr. 1950, p. 17-19, 22.

Advantages for evaluation of weld characteristics. Two instruments for this purpose—the "sclerometer" and the "Microcharacter"—are described. Photomicrographs show typical scratches. (Q29, K9)

226-Q. Rotor Forgings for Turbo-Generators. J. Novak. *Engineers' Digest*, v. 11, Mar. 1950, p. 72-74. Translated and condensed from *Bulletin des Schweizer Elektrotechnischen Vereines*, v. 40, no. 24, 1949, p. 943-951.

Mechanical properties of rotor forgings, influence of slab size on quality of forgings, influence of microstructure on mechanical properties and faults in the rotor material. (Q general, F22, T25, AY)

227-Q. Study of Crack Propagation Using High Speed Motion Pictures. Herbert I. Fusfeld and Josephine Carr Feder. *Journal of Applied Physics*, v. 21, Mar. 1950, p. 261-262.

Used to observe deformation and rupture in Al and brass at high strain rates. Preliminary studies of fracture were conducted by utilizing flat tensile specimens ½ in. wide and 1/32 in. thick with grids photographically imprinted on a sensitized surface. (Q26, Al, Cu)

228-Q. A High-Sensitivity Torsion Creep Unit. A. E. Johnson. *Journal of Scientific Instruments*, v. 27, Mar. 1950, p. 74-75.

Most data on creep of metals and alloys has been obtained with stresses causing creep rates of 10^{-7} per hr. or more. Describes apparatus for measuring rates as low as 10^{-9} per hr. Legs of the torsion meter are screwed into the ends of the thin-walled tubular test-pieces used. (Q3)

229-Q. Photoelastic Strain Analyzer. E. F. Smith and A. P. Wangsgard. *Journal of Polymer Science*, v. 5, Apr. 1950, p. 169-177.

Principles and apparatus necessary to measure photo-electrically "frozen-in" strains when the material has such a low strain optical coefficient that, at 100% strain and 0.01 in. thickness, less than ½ fringe is produced. Includes nomograph as aid in the calculations. (Q25)

230-Q. Flow of Mild Steel in the Austenite Range, 950-1,400° C. Paul Feltham. *Nature*, v. 165, Mar. 25, 1950, p. 489-490.

Flow of a 0.06% C steel was investigated in vacuum in above temperature range and over ranges of strain rate and stress. Results are discussed from the fundamental viewpoint. (Q24, CN)

231-Q. Surface Deformation and Friction of Metals at Light Loads. J. R. Whitehead. *Proceedings of the Royal Society*, ser. A, v. 201, Mar. 7, 1950, p. 109-124.

Apparatus for friction measurement. Deformation was studied by light and electron microscopy. Cu showed a departure from Amonton's law (proportionality of frictional force to load) at low loads, believed due to an oxide film. Al and Ag did not give this effect, probably because of contrasting oxide properties. Also describes a few experiments on sapphire, diamond, and boundary-lubricated metals. 27 ref. (Q9)

232-Q. Influence of the Elastic Constants on the Partition of Load Between Rivets. W. D. Mitchell and D. Rosenthal. *Proceedings of the Society for Experimental Stress Analysis*, v. 7, no. 2, 1949, p. 17-26.

Previous research shows that the load is not evenly distributed between rivets in a lap joint. An attempt is made to improve the situation by making rivets of material less rigid than the plates. Experimental results did not show expected improvement, because of deformation imposed on the rivets by the plates. SAE 1020 steel, brass, Al, and lucite bolts were used. (Q21, K13, CN, Cu, Al)

233-Q. Energy Losses and Fracture of Some Metals Resulting From a Small Number of Cycles of Strain. T. E. Pardue, J. L. Melchor, and W. B. Good. *Proceedings of the Society for Experimental Stress Analysis*, v. 7, no. 2, 1949, p. 27-39.

A rotating-beam fatigue machine was used for preliminary observations of the behavior of stainless steel, mild steel, Cu, Al, and cast iron subjected to repeated loads sufficiently high to produce failure below 10,000 repetitions of strain. S-N curves show relative strengths. (Q7, SS, ST, Cu, Al, CI)

234-Q. The Strength of Inserted Dies. G. Sachs, J. D. Lubahn, and L. J. Ebert. *Proceedings of the Society for Experimental Stress Analysis*, v. 7, no. 2, 1949, p. 45-72.

Internal pressures required to cause failure of a composite cylinder were determined analytically and experimentally, the latter yielding qualitative agreement with theory. Composite cylinders, each consisting of a hard, brittle insert and a ductile holder assembled with varying initial shrink pressures, were investigated. Shrink pressure is limited by complete plastic flow of the holder or by collapsing of the insert. Tests were made on a number of steels. (Q25, TS)

235-Q. The Stress Distribution in a Simply Supported Beam of I-Section Carrying a Central Concentrated Load. Arnold W. Hendry. *Proceedings of the Society for Experimental Stress Analysis*, v. 7, no. 2, 1949, p. 91-102.

Stress distribution under the load point, photo-elastic tests, and plastic bending of short I-beams. (Q25, CN)

236-Q. New Developments in Dynamic Strain Recording Equipment. Claude M. Hathaway. *Proceedings of the Society for Experimental Stress Analysis*, v. 7, no. 2, 1949, p. 119-126.

Latest improvements and designs; outlines applications and limitations. Includes circuit diagrams and photographs. (Q25)

237-Q. Preliminary Experiments for Testing Basic Assumptions of Plasticity Theories. Roger W. Peters, Norris F. Dow, and S. B. Batdorf. *Proceedings of the Society for Experimental Stress Analysis*, v. 7, no. 2, 1949, p. 127-140.

Experiments on loading conditions in which different plasticity theories predict different plastic behavior. Thin-walled cylinders of 14S-T4 Al alloy were loaded into the plastic range in compression and then twisted. Usefulness of the results for testing the validity of various theories of plasticity. (Q23, Al)

238-Q. Stresses in Keyways by Photoelastic Methods and Comparison With Numerical Solution. M. M. Leven. *Proceedings of the Society for Experimental Stress Analysis*, v. 7, no. 2, 1949, p. 141-154.

Shearing stresses in keyways in shafts subjected to torsion were evaluated for five ratios of keyway fillet radius to shaft diameter; photo-elastic and numerical solution methods were compared. It is believed that the most promising method of obtaining surface stresses on a body subjected to a general three-dimensional stress system, is that of cutting out a very thin surface section containing the outer surface of the model and then viewing the model perpendicular to the boundary surface. 12 ref. (Q25)

239-Q. A Casting Material for Three-Dimensional Photoelasticity. C. E. Taylor, E. O. Stitz, and R. O. Belsheim. *Proceedings of the Society for Experimental Stress Analysis*, v. 7, no. 2, 1949, p. 155-172.

An allyl ester resin, called Kriston, was used. Techniques and procedures used in casting and testing; mechanical and optical properties. Curves show variation of properties with temperature. 11 ref. (Q25)

240-Q. Bursting of Containers Under Pressure. (In French.) H. de Leiris. *Revue de Métallurgie*, v. 47, Jan. 1950, p. 19-28.

The paradoxical bursting characterized by absence of swelling and accompanied by marked fragmentation is believed to be a manifestation of metallic brittleness. Such fragility cannot be associated with a definite value of impact strength under normal conditions. Necessary strength to avoid possibility of bursting increases with increase in volume of containers and applied stresses. (Q23)

241-Q. Theories and Experimental Data on Creep and Relaxation of Polycrystals. (In French.) Pierre Laurent and Michel Eudier. *Revue de Métallurgie*, v. 47, Jan. 1950, p. 39-52.

Based on the literature and on experimental investigation of Mg and an Al alloy containing 9.7% Cu. Variation of mechanical properties during creep and relaxation. 24 ref. (Q3, Mg, Al)

242-Q. Report of the Commission on Boron Steels of the ISRID. II. Influence of Small Additions of Boron on the Properties of Semi-Hard Carbon Steels. (In French.) R. Potaszkin. *Revue de Métallurgie*, v. 47, Jan. 1950, p. 55-86; discussion, p. 86-87.

Continues comprehensive study on the basis of literature and experimental investigation. Transformations, phase diagrams, mechanical properties, physical properties, and microstructures. Appendix gives extensive test data. (Q general, N8, M24, AY)

243-Q. Fabrication of Cast Iron of High Hardness. (In French.) Gabriel Joly. *Fonderie*, Jan. 1950, p. 1916.

Proposes addition of Ni and Cr to white cast iron for increasing the hardness. Brittleness is also increased, hence the material can only be used for special purposes where this property is not harmful. Compositions and procedures. (Q29, CI)

244-Q. Influence of Columbium on Properties of Nickel-Chromium Steels. (In French.) Y. Okura and J. Omori. *Circulaire d'Informations Techniques*, v. 6, Aug.-Sept.-Oct. 1949, p. 385-394. Translated and condensed from *Tetsu to Hagane* (Japanese), v. 25, Nov. 25, 1939, p. 968-975.

Tabular and graphical data on four Ni-Cr steels containing 0, 1.10, 2.28, and 3.26% Cb. Effects on transformation points, mechanical properties, and corrosion by distilled water, and by inorganic aqueous salt solutions. (Q general, N8, R4, R5, AY)

245-Q. Influence of Contents of Carbon, Chromium, and Tungsten on Mechanical Properties of Certain Valve Steels. (In French.) S. Koshiba and K. Tanaka. *Circulaire d'Informations Techniques*, v. 6, Aug.-Sept.-Oct. 1949, p. 395-399. Translated from *Tetsu to Hagane* (Japanese), v. 34, Aug. 1948, p. 13-15.

Tabulated and charted data including transformation points and effects of temperatures up to 1050° C. on mechanical properties and oxidation resistance, show that Cr-W steels are as satisfactory for valves used at high temperatures as Cr-Si-W steels. (Q general, T7, AY, SG-h)

246-Q. Plastic Deformation of Cementite in Steel. (In Russian.) B. G. Livshits and B. N. Orlov. *Doklady Akademii Nauk SSSR* (Reports of the

Academy of Sciences of the USSR), new ser., v. 70, Jan. 11, 1950, p. 229-230.

Investigated for a cold-rolled carbon steel of eutectoid composition (0.82% C) annealed to obtain thin laminar pearlite. Polished specimens showed, at 7500×, laminae of cementite compressed by cold rolling. This observation disproves the common assumption that only ferrite is subject to plastic deformation, and that cementite is strictly a brittle phase. (Q24, CN)

247-Q. Effect of Residual Stresses on Fatigue of Compressor Valves. E. W. P. Smith. *Metal Progress,* v. 57, Apr. 1950, p. 480-481.

Valves are blanked from SAE 1065 spheroidized sheet steel, 0.062 in. thick, ball burnished, flattened, heated in a controlled-atmosphere furnace, quenched individually in oil, and tempered to Rockwell C-44 to 48, then ground and lapped. Residual quenching stress plus the operating stress caused failure in the original production valve. When these stresses were minimized or eliminated by thinning the valve corners, magnitude of the operating stresses alone was below the fatigue limit in an accelerated service test.
(Q7, J26, T7, CN)

248-Q. Tensile Tests of Internally Notched Plate Specimens. Samuel T. Carpenter and Wendell P. Roop. *Welding Journal,* v. 29, Apr. 1950, p. 161s-183s.

Test behavior at various temperatures of internally notched ¾-in. thick, 12-in. wide, low-carbon steel specimens including maximum loads, strain energy, and mode of fracture. Effect of ratio of width divided by thickness of plate. (Q27, CN)

249-Q. The Fracture of Mild Steel. C. F. Tipper. *Welding Journal,* v. 29, Apr. 1950, p. 183s. Condensed from *Iron & Coal Trades Review,* v. 157, 1948, p. 829.

Conclusions resulting from an investigation of causes of large fractures in welded ships.
(Q26, T22, CN)

250-Q. Transition Temperature of Ship Plate in Notch-Tensile Tests. E. M. MacCutcheon, C. L. Pittiglio, and R. H. Raring. *Welding Journal,* v. 29, Apr. 1950, p. 184s-194s.

Comprehensive study of steels following new specifications used in ship construction, together with some experimental steels; and an evaluation of specimens used in determining notch toughness and transition temperatures of steel for ship construction. 13 ref. (Q23, T22, CN)

251-Q. Axial Tension Impact Tests of Structural Steels. W. H. Bruckner and N. M. Newmark. *Welding Journal,* v. 29, Apr. 1950, p. 212s-216s.

Supplementary tension-impact tests were made with specimens of two killed steels and a rimmed steel, at different levels of initial energy. The data show that for the killed steels the transition temperature decreases with decreasing initial energy, but for the rimmed steel there is little change in transition temperature with change in initial energy of impact. (Q6, CN)

252-Q. Prejudging Low Carbon Drawing Quality Sheets. E. F. Lundeen. *Steel Processing,* v. 36, Apr. 1950, p. 186-188, 213.

Various test methods used to determine suitability for drawing or pressing into a particular shape. Production and inspection methods at the sheet mill.
(Q23, G4, S general, CN)

253-Q. An Investigation of the Weavability of Wire With Observations on the Defects of Wire and Wire Cloth. Part II. Walston Chubb, Jr. ***Wire and Wire Products,* v. 25, Mar. 1950, p. 222-225, 248.**

Special test procedures, including a transverse crimp-sensitivity test. Typical data are charted. (To be continued.) (Q5)

254-Q. Fundamentals of the Working of Metals. Part X. Effects of Hotworking and Coldworking on Grain Structure. George Sachs. *Modern Industrial Press,* v. 12, Apr. 1950, p. 6, 8, 44.

Clarified by diagrams. (Q24)

255-Q. Properties of ZK60—A Magnesium Extrusion Alloy. *SAE Journal,* v. 58, Apr. 1950, p. 69. From "ZK60: An Improved Magnesium Extrusion Alloy", by E. H. Schuette.

Alloy ZK60 contains about 5.7% Zn and 0.6% Zr. The latter has a grain-refining effect which increases strength and ductility. Physical and mechanical properties, and uses.
(Q general, P general, Mg)

256-Q. Effect of Manganese on Steel: Literature Report No. 3. C. V. Narayanswamy and B. R. Nijhawan. *Journal of Scientific & Industrial Research,* v. 9, Feb. 1950, p. 52-55.

A review dealing mainly with mechanical properties. 18 ref.
(Q general, AY)

257-Q. The Thermodynamics of Plastic Deformation and Generalized Entropy. P. W. Bridgman. *Reviews of Modern Physics,* v. 22, Jan. 1950, p. 56-63.

A theoretical discussion.
(Q24, P12)

258-Q. Stress and Strain Concentration at a Circular Hole in an Infinite Plate. Elbridge Z. Stowell. *National Advisory Committee for Aeronautics,* Technical Note 2073, Apr. 1950, 14 pages.

Formulas for the above under tension were derived for use in the plastic region. Values obtained are in good agreement with limited tests on 24S-T3 Al-alloy panels. (Q27, Al)

259-Q. Strength of Metal Aircraft Elements. *Munitions Board Aircraft Committee,* ANC-5a, May 1949, 109 pages.

Mechanical properties of alloy, carbon, stainless, bearing, heat resistant, and corrosion resistant steels, as well as Al and Mg alloys. 52 ref.
(Q23, AY, CN, SS, SG-c,g,h, Al, Mg)

260-Q. Distinction Between Apparent Elastic Limit and Limit of Magnetic Reversibility of Steel Under Tensile Stress. (In French.) André Langevin, Emmanuel Paul, and Marcel Reimbert. *Comptes Rendus* (France), v. 230, Feb. 20, 1950, p. 715-717.

Investigation of a specimen subjected to gradually increasing tensile stress revealed, on the basis of data obtained by mechanical and magnetic measurement, the presence of an intermediate region characterized by residual elongation of the order of 10^{-6} to 10^{-4} in relative value. This region is located between the limits of magnetic and mechanical reversibility, and the limit of apparent elasticity. Method of investigation, circuit diagram of apparatus, and graph of the correlated results.
(Q27, P16, ST)

261-Q. Energy Conditions and Changes in Deformation and Fracture. (In German.) Emil Podszus. *Zeitschrift für Metallkunde,* v. 41, Jan. 1950, p. 23-31.

Shows that only about 1% of the energy applied to deformation and fracture of a piece of material is absorbed by the material, while the remainder is evolved as heat. This heat—which can affect the material the same as heat treatment and may even exceed the melting point of the material—is said to be responsible for the difference between **theoretical and the actual mechanical properties of worked materials.** 16 ref. (Q general)

262-Q. Diagrammatic Representation of Displacements in Three-Dimensional Lattices. (In German.) Albert Kochendörfer. *Zeitschrift für Metallkunde,* v. 41, Feb. 1950, p. 33-36.

Diagrams show lattice conditions in crystals with longitudinal and transverse displacements. The combination of slip with the motion of these displacements is explained. Proposes that the terms "step and screw displacement" be replaced by "longitudinal and transverse displacement" since the latter terms are believed to be more expressive of actual behavior. 18 ref. (Q24)

263-Q. Textures and Their Effects in Sheets of 50-50 Nickel-Iron Alloy. (In German.) Erich Schmid and Hans Thomas. *Zeitschrift für Metallkunde,* v. 41, Feb. 1950, p. 45-49.

The above alloy was cold rolled from 6 to 0.35 mm. and its structure studied by an X-ray method. Tests showed that tensile strength is little affected by orientation of the grains while modulus of elasticity is lowest at an angle of 45° to the rolling direction. 17 ref. (Q24, Ni, Fe)

264-Q. Improvement of the Brinell Tester. (In Russian.) P. K. Kut'kov. *Stanki i Instrument* (Machine Tools and Equipment), v. 21, Jan. 1950, p. 28.

Adaptation of a device for bend testing standard specimens of cast iron. (Q29, Q5, CI)

265-Q. (Book) Strength of Materials. Ed. 7. F. V. Warnock. Sir Isaac Pitman and Sons, Ltd., Pitman House, Parkerstreet, Kingsway, London, W.C. 2, England. 15s.

Theory of stresses and strains and mechanical properties of metals. Theory is applied to the cases of thin cylinders, spheres, and pipes. A chapter on moments of inertia and the ellipse of inertia precedes five chapters dealing with various aspects of beam theory. Equipment and procedure for testing materials. Creep of metals with special reference to the effect of carbon, molybdenum, and other elements. A new chapter has been added on principles of photo-elastic stress analysis.
(Q general)

266-Q. (Book) Deformation and Flow; An Elementary Introduction to Theoretical Rheology. Markus Reiner. 346 pages. 1949. H.K. Lewis & Co., Ltd., London.

Basic concepts and numerical examples of application of theory. 5-page bibliography. (Q24)

R

CORROSION

117-R. Preventing Dissimilar Metal Corrosion. Gilbert C. Close. *Industrial Finishing,* v. 26, Mar. 1950, p. 54, 56.

Procedures followed by Northrop Aircraft to prevent corrosion of Mg when used in an assembly with other metals, which depends to a great degree upon proper insulation to prevent dissimilar-metal contacts.
(R1, Mg)

118-R. Rust and Stain Prevention With Water Displacing Fluids. *Electroplating and Metal Finishing,* v. 3, Mar. 1950, p. 253-255, 257, 265.

Techniques of use and applications. Action is based on the fact that certain surface-active materials will preferentially wet metal surfaces.
(R10)

119-R. Pipe-Type Transmission Cable Employs Novel Corrosion Protection.

Electric Light and Power, v. 28, Mar. 1950, p. 76-78.

Latest techniques of assembly, installation, operation, and protection against corrosion applied to 120-kv. pipe-type gas compression cable. For a salt-water river crossing, a "counterpoise" or control cable drains off excess potentials and acts as sacrificial corrosion metal. (R10)

120-R. Corrosion and Erosion of Pumps; Effects of Resistant Materials and Design. Norman Tetlow. *Chemical Age,* v. 62, Mar. 11, 1950, p. 373-374.

(R general, T29)

121-R. From a Metallurgist's Notebook: Corrosion of Chromium. H. H. Symonds. *Metal Industry,* v. 76, Mar. 3, 1950, p. 167-168.

Preservatives or brine added to meat passing through a food-processing machine were considered as a possible cause of the failure of the Cr plate on Al-bronze sleeves incorporated in the machine.

(R5, T29, Cr)

122-R. From a Metallurgist's Notebook: Aluminium Corrosion. H. H. Symonds. *Metal Industry,* v. 76, Mar. 10, 1950, p. 189-190.

The possibility of corrosion of Al-alloy switch boxes by wall plaster was investigated. Recommendations for choice of alloy and surface treatment to prevent a slight tendency toward such corrosion. (R6, T1, Al)

123-R. Tentative Method of Testing Chemical Anti-Rust Agents and Inhibitors in the Laboratory. (In German.) W. Wiederholt and B. Thiede. *Metalloberfläche,* sec. A, v. 4, Feb. 1950, p. 25-28.

A systematic outline of the method, analogous to ASTM methods used in the U. S. (R10)

124-R. Attack on Sheet Steel by Hot Impregnating Oil and Its Prevention. (In German.) G. Schikorr. *Werkstoffe und Korrosion,* v. 1, Jan. 1950, p. 2-3.

Such oil can corrode iron considerably, because of acid components. However, corrosion can be almost wholly prevented by addition of 1% CaO. (R7, CN)

125-R. Effect of Heat Treating on the Corrosion Resistance of a Magnesium Alloy Containing 7% Al. (In German.) W. Bulian. *Werkstoffe und Korrosion,* v. 1, Jan. 1950, p. 10-12.

Test results in an 0.3% aqueous NaCl solution show that corrosion resistance increases as heterogeneity of the metal structure increases; hence, a homogenizing treatment lowers resistance to corrosion. 10 ref. (R5, J21, Mg)

126-R. Corrosive Behavior of Copper Alloyed Steels and Wulff and Uhlig's Passivity Theory. (In German.) K. Werny and R. Eschelbach. *Werkstoffe und Korrosion,* v. 1, Jan. 1950, p. 16-20.

The small amount of Cu (0.2-0.3%) required for maximum corrosion resistance indicates the formation of ionic solutions between Cu and Fe, with Cu and copper oxide forming protective films around the cathodic iron. According to Wulff and Uhlig's theory (interchange of electrons) the amount of Cu required for maximum protection would be 3.1%. (R10, AY)

127-R. Tubing Corrosion Due to Hydrogen Sulfide, Accelerated by Spent Acid. John G. Yapuncich. *Oil and Gas Journal,* v. 48, Apr. 1950, p. 68-69, 71, 90.

Unusual condition of severe corrosion found in an 8900-ft. Wyoming well, although similar wells in the field were little troubled with corrosion. Investigation indicated that spent acid diluted with formation water was left in the well for a considerably longer time than is customary. (R5, T28, CN)

128-R. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry,* v. 42, Apr. 1950, p. 69A-70A.

Oxidation behavior of 18-8S stainless steel at 1800° F. in different oxidizing atmospheres obtained as a result of an ONR research program. (R2, SS)

129-R. Acid Corrosion Resistance of Tantalum, Columbium, Zirconium, and Titanium. Donald F. Taylor. *Industrial and Engineering Chemistry,* v. 42, Apr. 1950, p. 639.

Metals were tested in HCl, H_2SO_4, HNO_3, H_3PO_4, and $FeCl_3$ solutions of various concentrations. Results show Ta to be completely resistant to all solutions evaluated; Cb had high resistance to all except hot concentrated HCl and H_2SO_4; Zr and Ti were the least resistant. (R5, Ta, Cb, Zr, Ti)

130-R. Corrosion of Electro-Deposited Nickel; Resistance to Water Containing Dissolved Carbon Dioxide and Air. Leonard C. Flowers and James B. Kelley. *Industrial and Engineering Chemistry,* v. 42, Apr. 1950, p. 719-727.

Experimental investigation showed that Ni electrodeposits from baths containing salts of naphthalene disulfonic acids are dissolved rapidly and continuously at room temperature by water containing CO_2. Corrosion rates range from 25 to 96 mg. per sq. dm. per day. Electrodeposits from baths containing no brightening agent may be pitted under these conditions but do not corrode rapidly; neither does rolled sheet nickel. 14 ref. (R4, L17, Ni)

131-R. Corrosion Mitigation Discussed at United Nations Meet. W. Beck. *Corrosion* (News Section), v. 6, Apr. 1950, p. 19-21.

Reviews corrosion papers presented at Lake Success, Aug. 17-Sept. 6, 1949. (R general)

132-R. Oil Can Control Wear. R. E. Jeffrey, Jr. and J. M. Plantfeber. *Corrosion* (Technical Section), v. 6, Apr. 1950, p. 115-119.

A new development in engine lubricants shows that oil can control wear, where largely due to corrosion. As result of a thorough study of engine wear, the effect of the corrosive action of combustion products was found to be great, especially in the case of certain high-speed diesel-engine applications. Effect of sulfur content of fuel. The new engine lubricating oil reduces wear to as low as one-tenth of that usually found in certain diesel-engine applications. (R7, Q9, T25)

133-R. Field Experience With Corrosion Protection of Galvanized Steel Substation Structures. Siebert L. Miller. *Corrosion* (Technical Section), v. 6, Apr. 1950, p. 120-122.

Results of comparative "in-service" tests of several materials for substation structures and transmission line towers. (R3, T1, CN, Zn)

134-R. Corrosion of Steel Pipe by Chlorinated Seawater at Various Velocities. V. B. Volkening. *Corrosion* (Technical Section), v. 6, Apr. 1950, p. 123-127; discussion, p. 127-128.

Corrosion rates were obtained for six residual chlorine concentrations ranging from 0 to 4.0 ppm. at five seawater velocities of 0.1-6.4 ft. per sec. Pitting rates were accurately measured and compared with weight-loss corrosion data. Minimum effective dosage of chlorine was determined for elimination of marine fouling organisms. (R4, CN)

135-R. The Corrosion Products on Zinc Anodes Used Underground. E. A. Anderson. *Corrosion* (Technical Section), v. 6, Apr. 1950, p. 129-131; discussion, p. 131.

The presence of sulfates, such as gypsum, in the soil around Zn anodes used in the cathodic protection of pipelines has been observed to largely prevent the loss of current flow normally found in ordinary soils. Examination of the corrosion products on two anodes used in gypsum-bearing soil indicated the mechanism by which sulfates affect film resistance. (R10, Zn, Cn)

136-R. Field and Laboratory Tests of Sodium Chromates and Alkalies for Controlling Corrosion in Gas-Condensate Wells. C. K. Eilerts, R. V. Smith, F. G. Archer, L. M. Burman, Faye Greene, and H. C. Hamontre. *Corrosion* (Technical Section), v. 6, Apr. 1950, p. 131-133; discussion, p. 134-136. (Condensed.)

Previously abstracted from *World Oil.* See item 6B-111, 127, 138, 160, 178, and 186, 1949. (R10, ST)

137-R. Review of "Forum on Corrosion Research" Held at Washington, D. C., Nov. 9-10, 1949. J. J. Harwood and Fred Schulman. *Journal of the Electrochemical Society,* v. 97, Apr. 1950, p. 83C-91C.

10 references. (R general)

138-R. The Effect of Amines on the Electrode Potential of Mild Steel in Tap Water and Acid Solutions. Norman Hackerman and J. D. Sudbury. *Journal of the Electrochemical Society,* v. 97, Apr. 1950, p. 109-116.

Potentials of SAE 1020 steel were measured in 1.0 *N* H_2SO_4 and tap water, each with added amines. Steady state potential was found to be a function of nature and concentration of the amine additives. Anodic and cathodic polarization measurements showed that both areas were affected by the inhibitor. The data are discussed in terms of a generalized theory of corrosion inhibition. 19 ref. (R10, CN)

139-R. Corrosion in Water-Flood Operations. F. A. Prange. *World Oil,* v. 130, Apr. 1950, p. 157-158, 160.

Types of corrosion, choice of alloys for these oil-field operations, and preventive measures.

(R general, T28, ST)

140-R. The Behaviour of Nickel-Chromium-Iron Alloys in Carbon-Bearing Gases in the Range 900°-1000° C. D. M. Dovey and I. Jenkins. *Journal of the Institute of Metals,* v. 76, Feb. 1950, p. 581-596.

Corrosion of Ni-Cr electrical-resistance alloys used at 900-1000° C. in partially burned manufactured gas was investigated. The corrosion, which is shown to be due to simultaneous carburization and oxidation of the alloy with rapid intergranular oxidation in depth, is typical of that known as "green rot". Order of attack was less in alloys containing Fe and the presence of approximately 2% Si was sufficient to suppress the corrosion completely. Possible factors governing the corrosion mechanism, and importance of the oxide layer as a barrier to carbon entry into the matrix. 14 ref. (R9, SG-q)

141-R. A Method for Assessing the Relative Corrosion Behaviour of Different Sea-Waters. T. Howard Rogers. *Journal of the Institute of Metals,* v. 76, Feb. 1950, p. 597-611.

Experience accumulated over many years has shown that the corrosive attack of sea water on Cu-base alloys varies considerably because of factors not easily revealed by ordinary chemical tests. Evaluates the corrosiveness of sea water by immersing a piece of Cu sheet of given area in the sample and estimating the amount of Cu dissolved in 22 hr. under standard conditions. (R4, Cu)

142-R. Domestic Copper Piping;

Causes of Pitting Corrosion. *Metallurgia,* v. 41, Mar. 1950, p. 271-272.

Statement by British Non-Ferrous Metals Research Association for the guidance of manufacturers and users. Influence of character of water, effect of composition of tube, and effect of carbonaceous films. (R2, Cu)

143-R. Distribution of the Corrosion Process Along a Tube. (In Russian.) A. N. Frumkin. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 23, Dec. 1949, p. 1477-1482.

Distribution of corrosion in an endless tube filled with electrolyte having a fixed potential applied at the exit. Such a situation is exemplified by having a tube of one metal inserted into the wall of a large reservoir of another metal filled with the same electrolyte. Corrosion is thus studied as an anodic process on the wall of the tube. Formulas for determination of distribution of potential inside the tube are proposed and interpreted for different values of the variables. (R1)

144-R. Dissolving Rate and Solution Potential of Chromium. (In Russian.) Ya. V. Durdin and A. M. Markevich. *Zhurnal Obshchei Khimii* (Journal of General Chemistry), v. 19(81), Dec. 1949, p. 2131-2147.

Investigated in HCl and H_2SO_4 of various concentrations. The rate of solution in HCl (up to 8*N*) and in H_2SO_4 (up to 10*N*) is independent of intensity of stirring, indicating that the rate is not influenced by the diffusion process, as indicated by the high temperature coefficient of this rate. 12 ref. (R5, Cr)

145-R. Vertical Distribution of Photographically Active Particles, Precipitated From Metals by Atmospheric Corrosion. (In Russian.) I. L. Roikh. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 70, Jan. 11, 1950, p. 253-256.

Claims that certain of the above effects were obtained with Mg, Al, and Zn. Quantitative data are given for variations of this effect with surface condition of the samples. No explanation is given for the peculiar phenomena reported.
(R3, Mg, Al, Zn)

146-R. Action of Corrosion and Stress on 13% Cr Stainless Steel. H. H. Uhlig. *Metal Progress,* v. 57, Apr. 1950, p. 486-487.

Experiments which suggest that failure by cracking of stressed martensitic stainless steels exposed to a corrosive environment under stress may be best described as "hydrogen embrittlement". (R1, SS)

147-R. Plug Dezincification in Cartridge Brass. A. L. Simmons. *Metal Progress,* v. 57, Apr. 1950, p. 496-497.

Defect termed "measles" which was encountered immediately after pickling equipment was modernized by substitution of spray equipment for vats. Experimental work indicated that the defect was plug dezincification. Causes may be steel, lead, or nonmetallic inclusions; and aeration of the solution. (R2, L12, Cu)

148-R. Corrosion: New Rust Preventives. William D. Robertson. *Chemical Engineering,* v. 57, Apr. 1950, p. 290, 292.

Use of Na and K molybdates or tungstates dissolved in small concentrations in circulating water to prevent corrosion of iron and steel. (R10, Fe)

149-R. Corrosion Problems in Gas Purification Units Employing MEA Solutions. F. C. Riesenfeld and C. L. Blohm. *Petroleum Refiner,* v. 29, Apr. 1950, p. 141-150.

Experimental work on corrosion of carbon, alloy, and stainless steels; and of aluminum and its alloys in contact with aqueous solutions of mono-ethanolamine or mixtures with diethylene glycol and water. Such solutions are used to remove CO_2 and H_2S from flue gas, hydrogen, and refinery and natural gases.
(R7, T29, ST, Al)

150-R. Excerpts From Symposium on Testing Gear Oils. *SAE Journal,* v. 58, Apr. 1950, p. 46-53; discussion, p. 53. Based on "Performance Testing of Gear Lubricants", by W. J. Backoff, N. D. Williams, and K. Boldt; "Laboratory Wear Tests With Automotive Gear Lubricants", S. A. McKee and others; and "Moisture Corrosion Test for 2-105B Gear Lubricants", by T. P. Sands.

Includes illustrations of equipment; corrosion-test data; and discussion of Sands' paper by J. P. Stewart.
(R11, Q9, ST)

151-R. Coupling Dissimilar Metals Adds to Corrosion Problems. Sidney K. Gally. *American Gas Journal,* v. 172, Apr. 1950, p. 21-23, 26.

Principles and recommendations for protection of copper-iron and copper-steel underground pipe joints.
(R10, Cu, Fe)

152-R. The Influence of Stress Upon the Electrode Potential and Polarization of Iron and Steel in Acid Solution. M. T. Simnad and U. R. Evans. *Transactions of the Faraday Society,* v. 46, Mar. 1950, p. 175-186.

Experimental results show that in acid solution, where no oxide film can survive, the unpolarized potential of cold worked iron and steel is anodic in relation to the same material in the annealed condition. The same difference was observed in experiments where a cathodic current was applied; at any given current density, potential of annealed specimens is about 25 mV. nobler than that of the cold rolled material. Corrosion rate is affected by dissolved oxygen and by previous surface treatment. 25 ref. (R1, R5, Fe)

153-R. From a Metallurgist's Notebook: Sherardized Strip. H. H. Symonds. *Metal Industry,* v. 76, Mar. 31, 1950, p. 247.

Thickness of coating, bend tests, and copper sulfate tests were among the methods of examination used to determine the cause of failure in the surface of certain samples of the above. It was concluded that failure was due to corrosion by residual moisture. (R general, L16, Zn)

154-R. Die-Cast Zinc Alloy Conduit Fittings; Practical Experience of Their Use. L. A. J. Lodder. *Metal Industry,* v. 76, Mar. 31, 1950, p. 249-250.

Results of exposure tests indicate that corrosion between Zn-Al junctions is normally of far less consequence than that at steel-and-malleable iron junctions. (R1, Zn)

155-R. The Corrosion of the Austenitic Stainless Steels. Part II. Pitting and Intergranular Corrosion. G. T. Colegate. *Metallurgia,* v. 41, Mar. 1950, p. 259-262.

Mechanisms involved, effects of alloying additions, and preventive methods. (To be continued.)
(R2, SS)

156-R. Electrical Current Resulting From the Supply of Oxygen to Galvanic Elements as a Measure of the Oxidation and Inception of Corrosion of Metals. (In German.) F. Tödt. *Werkstoffe und Korrosion,* v. 1, Feb. 1950, p. 49-51.

The amount of current generated by the oxidation of metals is a direct indication of their respective corrosive properties. 12 ref. (R1)

157-R. Evaluation of Rust Inhibitors for Medical Instruments. (In German.) K. Fischbeck and N. Muller. *Werkstoffe und Korrosion,* v. 1, Feb. 1950, p. 52-56.

Treatments of steel instruments with sodium carbonate and nitrite solutions are equally effective in reducing the susceptibility to rusting.
(R10, T10, ST)

158-R. Experimental Research on the Reaction Between Water Vapor and Iron. (In German.) K. Wickert and H. Pilz. *Werkstoffe und Korrosion,* v. 1, Feb. 1950, p. 56-64.

Experiments made to determine the corrosive effect of steam at different temperatures on different types of iron and steel. (R4, Fe)

159-R. Corrosion of Intermetallic Compounds. (In German.) Karl Löhberg. *Zeitschrift für Metallkunde,* v. 41, Feb. 1950, p. 56-59.

Shows that water and water vapor decompose intermetallic compounds when their components have different electrochemical potentials and when they are subject to corrosion. Data are given for AlSb, Mg_3Sb_2, Mg_3Bi_2, Mg_2Sn, Ag_3Pb, and 50-50 alloys of some of these compounds with Al, Mg, Sb, Sn, and Pb. Methods of preventing corrosion. There seems to be no correlation between crystal structure or atomic dimensions and corrodibility.
(R1, M26, Al, Mg, Sb, Bi, Sn, Pb, Ag)

S

INSPECTION AND CONTROL

129-S. Inspection of Sheet and Strip. J. E. Jenkins. *Light Metals,* v. 13, Feb. 1950, p. 98-105; Mar. 1950, p. 140-145.

Practical methods for inspecting of light-alloy sheet and strip. Feb. issue: Personnel, principles, and procedure. Mar. issue: Common defects in rolled sheet and strip; methods for recovery of material from rejects.
(S13, A8, Al, Mg)

130-S. Cutting Costs by Standardizing Tool Materials. E. Griffiths. *Iron Age,* v. 165, Mar. 30, 1950, p. 94-97.

Westinghouse program of tool-material control and standardization embraces purchasing and inventories, furnace strain relief, machining, and other factors bearing on choice and use of tool and die steels. (S22, TS)

131-S. The Analytical Quantometer: It's Lightning Fast and Highly Accurate. F. L. Church. *Modern Metals,* v. 6, Mar. 1950, p. 23-24.

Automatic spectrographic equipment used by Apex Smelting Co. for precise control of compositions in Al scrap-melting operations. (S11, Al)

132-S. Conductometric Method for the Determination of Carbon in Steel. E. L. Bennet, J. H. Harley, and R. M. Fowler. *Analytical Chemistry,* v. 22, Mar. 1950, p. 445-448.

Apparatus for determining small amounts of carbon in steels by measuring change in conductivity of a $Ba(OH)_2$ solution. Results compare favorably with those obtained by use of combustion and gas-fractionating apparatus. (S11, ST)

133-S. Determination of Carbon in Ferrous Alloys. Robert M. Fowler, W. G. Guldner, T. C. Bryson, John L. Hague, and H. J. Schmitt. *Analytical Chemistry,* v. 22, Mar. 1950, p. 486-488.

Summarizes round-table discussion. Each speaker discussed the apparatus used in his laboratory for alloys containing less than 0.10% C.
(S11, Fe)

134-S. The Inspection and Testing of Engineering Materials. R. O. Wates.

Science & Engineering, v. 2, Dec. 1949, p. 213-217. Reprinted from *Engineering Inspection,* v. 13, no. 1, 1949.

Organization and operation of a department concerned with the testing and inspection of metallic materials. (S general)

135-S. Development, Significance and Uses of Specifications for Cast Iron. H. Bornstein. *Foundry,* v. 78, Apr. 1950, p. 78, 222, 224-227.
(S22, CI)

136-S. A Quick Test for Carbon in Steel. Yun-Luan Sun. *Foundry,* v. 78, Apr. 1950, p. 86-87, 220.

Procedure for determining carbon using a Rockwell hardness test on a quenched specimen. (S11, ST)

137-S. Advances in Inspection. Dorian Shainin. *Tool Engineer,* v. 24, Mar. 1950, p. 17-21.

Recent developments in fixed type gaging. Increased applications of the principles of optics, electronics, and airflow. (S14)

138-S. Noncontacting Beta-Ray Thickness Gage. C. W. Clapp and S. Bernstein. *General Electric Review,* v. 53, Mar. 1950, p. 31-34; *Electrical Engineering,* v. 69, Apr. 1950, p. 308-310.

How beta rays, measured by an ionization chamber, give indication, record, or control of thickness of homogeneous materials of various textures and consistencies without physical contact. (S14)

139-S. Geiger-Muller Tubes in Industrial Radiography. O. J. Russell. *Electronic Engineering,* v. 22, Mar. 1950, p. 94-98.
(S13)

140-S. Effects of an Aging Treatment on Life of Small Cast Vitallium Gas-Turbine Blades. Charles A. Hoffman and Charles Yaker. *National Advisory Committee for Aeronautics,* Technical Note 2052, Mar. 1950, 33 pages.

Twenty blades aged for 48 hrs. at 1500° F. were compared with 33 unaged blades operated at a blade temperature of approximately 1500° F. and a stress of 20,000 psi. at the blade-failure plane.
(S21, J27, T25, Co, SG-h)

141-S. Inspection by Radon of Large High-Pressure Vessels. V. E. Pullin. *Engineer,* v. 189, Mar. 3, 1950, p. 262-263.

Probably the first example of the use of high concentrations of radon for routine examination of Grade I pressure vessel welding. (S13, T26)

142-S. Spectro-Analytical Investigation of Sand- and Chill-Cast Al-Si-Cu Alloys. (In German.) G. Müller-Uri. *Spectrochimica Acta,* v. 3, nos. 5-6, 1949, p. 560-568.

Development of a standard method for analysis of Al containing 5% Si, Mg, and Cu. Chill-cast rods 3 mm. in diam. are sparked with a Feussner type source. Wave lengths used for Mg, Si, Cu, Mn, Fe, Zn, Ti, and Ni are listed with other details of procedure. (S11, Al)

143-S. Spectro-Analytical Determination of Iron in Zinc Blende. (In German.) F. Rost. *Spectrochimica Acta,* v. 3, nos. 5-6, 1949, p. 569-574.

11 references. (S11, Fe, Zn)

144-S. Spectrographic Analysis of Slags Using Spark Technique. (In English.) J. Eeckhout. *Spectrochimica Acta,* v. 3, nos. 5-6, 1949, p. 575-583.

Quantitative method for the analysis of steel-furnace slags. A high-voltage condensed-spark excitation is used with powdered samples on a flat pure-graphite electrode. Calibration curves were prepared both for determination of percentage of different elements in the slags, using CuO as an internal standard, and for determination of oxide-silica ratios, using a mixture of sample with pure graphite. (S11, ST)

145-S. Experiences With Temperature Indicating Colors. (In German.) Kurt Guthmann. *Stahl und Eisen,* v. 70, Feb. 2, 1950, p. 116-118.

Method and results reported in foreign and domestic literature. 12 ref. (S16)

146-S. There's Profit in Automatic Gaging. A. Sanford. *Machinery* (American), v. 56, Apr. 1950, p. 146-151.

Progressive steps that can be employed to decrease inspection costs—from application of indicator gages to the use of complex machines that automatically position the parts, measure their size, and segregate them into various classifications.
(S14)

147-S. Functional Checking of Gear Teeth. Louis D. Martin. *Machinery* (American), v. 56, Apr. 1950, p. 208-213.

Equipment and procedures. A functional check is a means of inspection that duplicates, or comes close to duplicating, the final use of a product. (S14)

148-S. Blade Inspection. *Aircraft Production,* v. 12, Apr. 1950, p. 120-122.

Sigma electric transmitting gages used to give dimensional indications of profile variations in turbine blades
(S14)

149-S. Quality Control at Sunnyvale. *Western Machinery and Steel World,* v. 41, Mar. 1950, p. 74-77.

Equipment at Sunnyvale, Calif., shop of Westinghouse Electric Corp.
(S12)

150-S. Measurement of Open Hearth Bath Temperatures. *Industrial Heating,* v. 17, Mar. 1950, p. 458, 460, 462, 464. Condensed from paper by H. T. Clark.

Recent developments.
(S16, D2, ST)

151-S. Metal Decorating Ovens Require Precise Temperature Control. *Industrial Heating,* v. 17, Mar. 1950, p. 481-482, 484, 486, 488.

Controls used with continuous-feed ovens. (S16, L26)

152-S. Steel Compositions and Specifications From the Steel Producers Viewpoint. Charles M. Parker. *Blast Furnace and Steel Plant,* v. 38, Apr. 1950, p. 438-443, 468. A condensation.

Previously abstracted from another version in *SAE Journal.* See item 12B-74, 1949. (S22, ST)

153-S. An X-Ray Method for Determining Tin Coating Thickness on Steel. H. F. Beeghly. *Journal of the Electrochemical Society,* v. 97, Apr. 1950, p. 152-157.

Results were obtained comparable in accuracy and reproducibility to those obtained with usual chemical methods. The principle is applicable to other coatings and to continuous indication and control of tin-coating weights on the electrotinning line. Such a unit has been designed and built. (S14, L17, Sn, ST)

154-S. The Trace Analysis of Silicon in Vanadium and Uranium; A Spectrophotometric Method. Ruth Guenther and Richard H. Gale. *U. S. Atomic Energy Commission,* AECD-2792, Nov. 8, 1949, 9 pages.

Metal is removed by $CHCl_3$ extraction of its cupferrate, silicomolybdate color developed, and transmittancy determined at 390 $m\mu$. System shows adherence to Beer's Law from 0.02-0.28 mg. Si per 100 ml. with a reproducibility of $\pm$0.004 mg. Si per 100 ml. (S11, V, U)

155-S. The Use of a Polarizer in the Disappearing Filament Optical Pyrometer. R. G. Giovanelli and W. R. G. Kemp. *Journal of Scientific Instruments,* v. 27, Mar. 1950, p. 69-71.

Polarizer was found to give complete disappearance of straight flat pyrometer filaments for apertures considerably larger than permissible in conventional pyrometers. Larger apertures result in higher visual resolution, and greater precision may be obtained in temperature measurements. (S16)

156-S. Speed and Contrast in Radiography. H. S. Tasker. *Photographic Journal,* v. 90B, Jan.-Feb. 1950, p. 9-21.

The density differences produced in a radiograph by a difference of section thickness depend on degree of absorption of the radiation, contrast of the film at the density level employed, and magnitude of the difference of section. Since absorption of radiation varies with kilovoltage, and film contrast with photographic density, there is a reciprocal relation between kilovoltage and density of the radiograph. The form of this relation and its effect on exposure time was examined for several different X-ray films of aluminum and mild steel. (S13)

157-S. Automatic Control of Industrial Furnaces. Leo Walter. *Engineer,* v. 189, Mar. 3, 1950, p. 260-262; Mar. 10, 1950, p. 292-294; Mar. 17, 1950, p. 324-325; Mar. 24, 1950, p. 351-352.

Various systems are clarified by schematic diagrams. (S16)

158-S. Automotive Cast Iron, Including Brake Drums. R. A. McElwee. *Foundry Trade Journal,* v. 88, Mar. 16, 1950, p. 281-283.

Specifications, foundry practice, and routine tests.
(S22, E general, T21, CI)

159-S. Hydrogen in Aluminium; Method of Determination—Effect on Pore Formation. Y. Dardel. *Metal Industry,* v. 76, Mar. 17, 1950, p. 203-206.

Effect of pore formation during solidification, heat treatment, and welding, together with a method for determination of hydrogen content. 21 ref. (S11, N12, Al)

160-S. Surface Thermometer. (In French.) M. E. Brun. *Journal des Recherches du Centre National de la Recherche Scientifique,* no. 10, 1950, p. 21-22.

A newly developed instrument for temperatures of −150 to 600° C., characterized by small size and high sensitivity. (S16)

161-S. Ultrasonic Testing of Gas Turbine Disks. *Metal Progress,* v. 57, Apr. 1950, p. 468-473.

To correlate indications derived from ultrasonic testing, 22 complete forgings were sectioned and discontinuities or coarse crystalline regions revealed. Analysis of inspection reports on 839 such forgings of high-alloy (16-25-6 Cr-Ni-Mo) for jet-engine disks shows that minor indications found in the intermediate stage of forgings are not necessarily a cause for rejection. However, 3.5% of the sound upset blocks developed rejectable defects during the finishing stages of forging. Of the 839 original blocks, 772 finished forgings were accepted.
(S13, T25, F22, SS, SG-h)

162-S. Sonic Tests Spot Flaws in Heavy Forgings. Robert W. Snowden. *Iron Age,* v. 165, Apr. 13, 1950, p. 77-81.

Pictorial study, including Oscilloscope photos of all types of common defects. (S13, CN)

163-S. New Control System Improves Pipe Quality. D. A. Evans. *Iron Age,* v. 165, Apr. 13, 1950, p. 82-85.

Multiple-correlation method using routine tests which analyzes effects of materials and methods on pipe production. Three variables—carbon, manganese, and wall thickness—give a quick statistical check on quality of steel pipe. (S12, CN)

164-S. What Radioisotopes Can Mean to Industry. Charles Rosenblum. *Nucleonics*, v. 6, Apr. 1950, p. 25-36.

Applications to problems in petroleum chemistry, metallurgy, polymerization, lubrication, corrosion, electrochemistry, agriculture, animal husbandry, and food processing. Analytical radiometric analysis is outlined. 53 ref. (S19, S11)

165-S. Neutron Spectroscopy for Chemical Analysis. III. Thermal Neutrons, Neutron Flux, Activation. T. I. Taylor and W. W. Havens, Jr. *Nucleonics*, v. 6, Apr. 1950, p. 54-66.

Analytical application of thermal neutrons. Methods of analysis involving transmission measurements, neutron-flux reduction by an absorber, and radioactivation by neutrons. 24 ref. (S11)

166-S. Air Gages Aid Quality Production. H. E. Linsley. *American Machinist*, v. 94, Apr. 17, 1950, p. 73-77.

Machining operations, precision gaging, assembly and testing of refrigeration compressors. (S14, G17)

167-S. Niessner's Rapid-Testing Process for Identifying Alloys. (In German.) F. Lilh. *Werkstoffe und Korrosion*, v. 1, Feb. 1950, p. 70-74.

Proposed patented method is an electrochemical process in which the e.m.f. generated by the alloy to be tested and that of a standard electrode metal in a suitable electrolyte are compared. (S10)

168-S. Report on the Progress of Analytical Chemistry. (In German.) *Fresenius' Zeitschrift für analytische Chemie*, v. 130, nos. 2-3, 1950, p. 235-299.

A classified review of recent literature, with different sections by different authors. (S11)

169-S. Measurement of Waviness of Finished Surfaces. (In Russian.) P. E. D'yachenko and V. Z. Vainshtein. *Stanki i Instrument* (Machine Tools and Equipment), v. 21, Jan. 1950, p. 15-16.

Defines waviness as regular, repetitive irregularity of the surface caused by nonuniformity of the cutting process. Special modifications of ordinary profilometers to measure waviness of surfaces. (S15)

170-S. (Book) A.S.T.M. Standards on Copper and Copper Alloys. Rev. Ed. 496 pages. 1949. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

Cu, Cu alloys, cast and wrought electrical conductors, and nonferrous metals used in Cu alloys. (S22, Cu)

171-S. (Book) Laboratory and Workshop Notes. Ruth Lang, Editor. 273 pages. 1949. Edward Arnold & Co., London.

Selected and reprinted from *Journal of Scientific Instruments*. Includes sections on joining, glass manipulation, vacuum, pressure, electrical, magnetic, optical, technique and apparatus, etc.
(S general, P general)

172-S. (Book) L & N Bibliography of Polarographic Literature. 102 pages. 1950. Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia 44, Pa.

Presents 2201 references listed according to date of publication (1903-1949). Includes author and subject indexes. (S11)

173-S. (Book) Précis d'Analyse Chimie des Aciers et des Fontes. (Chemical Analysis of Steels and Cast Irons.) M. Jean. 542 pages. 1949. Dunod, 92 rue Bonaparte, Paris 6, France. 3360 fr.

Details of modern methods, particularly from the point of view of production control. Scientific principles are also included. Includes bibliography. ((S11, ST, CI)

T

APPLICATIONS OF METALS IN EQUIPMENT

165-T. In Hotel and Restaurant. *Light Metals*, v. 13, Mar. 1950, p. 115-119.

Miscellaneous applications of Al. (T10, Al)

166-T. Aluminium-Alloy Lifeboats. *Light Metals*, v. 13, Mar. 1950, p. 122-124.
(T22, Al)

167-T. Ideal Home Exhibition. *Light Metals*, v. 13, Mar. 1950, p. 132-139.

Use of Al in decorative arch.
(T26, Al)

168-T. Progress Report—Aluminium in Athletics. *Light Metals*, v. 13, Mar. 1950, p. 129-131.

Use in athletic equipment at the Olympic Games of 1948. (T10, Al)

169-T. Demountable Buildings. *Light Metals*, v. 13, Mar. 1950, p. 156-160.

Australian Al-alloy prefabricated buildings such as garages. (T26, Al)

170-T. Prefabricated Aluminum Houses. Tom Bishop. *Metal Progress*, v. 57, Mar. 1950, p. 338.

Secondary Al alloys, originally obtained from the accumulation of scrap material salvaged from German aircraft destroyed over Britain, form the basic material used in the manufacture of prefabricated houses at Gloucestershire, England. Constructional and fabrication details.
(T26, Al)

171-T. Aluminum Fins for Tubes. *Electronics*, v. 23, Apr. 1950, p. 206, 208.

Used for cooling high-power transmitting tubes. A new bonding process employs a hollow steel core that surrounds the copper anode, and is soldered easily to it. A muff of aluminum is cast and bonded to the steel. 140 aluminum radiator fins are brazed to this muff.
(T1, K general, Al)

172-T. Low-Cost Aluminum Beverage Cases Now Mass-Produced. *Modern Metals*, v. 6, Mar. 1950, p. 19-20.
(T29, Al)

173-T. Portable Grain Conveyor Uses Aluminum to Advantage. *Modern Metals*, v. 6, Mar. 1950, p. 34-35.
(T3, Al)

174-T. Aluminum Sleeping Cars for Three Roads. *Railway Age*, v. 128, Mar. 18, 1950, p. 52-56.
(T23, Al)

175-T. Plastics Vs. Metals in Engineering Applications. William Schack. *Materials & Methods*, v. 31, Mar. 1950, p. 49-52.

Tabular comparison of properties. Case histories in which plastics have replaced metals.
(T general, Q general, P general)

176-T. The Place of Aluminium in Packaging. E. G. West. *Metallurgia*, v. 41, Feb. 1950, p. 204-208.

Present applications and future prospects. Types and requirements of package, packaging material, foil, collapsible tubes, cans, pressed containers, barrels, and crates. (T10, Al)

177-T. Anodes. (In German.) Edmund R. Thews. *Metalloberfläche*, sec. B, v. 2, Feb. 1950, p. 25-28.

The most important properties of anodes, and the factors which indirectly affect their efficiency and life. Shows that the decomposition products deposited on anodes often have a favorable effect on the reaction. Anode materials and methods of fabrication. (T5, L17, C23)

178-T. Silent Wardens. Eleanor Harvill. *Steelways*, v. 6, Mar. 1950, p. 21-23.

How hacksaw-resisting bars are made for prisons. They contain Cr-alloy inserts which resist sawing and drilling. The carbon steel provides toughness. Molten steel is poured around the inserts to form ingots which must be rolled and shaped, then heat treated.
(T26, D9, CN, AY)

179-T. New Diesel Engine Weighs Under 5 Lb/Hp. W. F. Bradley. *Automotive Industries*, v. 102, Apr. 1, 1950, p. 30-32, 80.

British diesel engine features compact V-8 design and extensive use of light alloys. Also uses of phosphor bronze and alloy steels.
(T25, Al, Cu, AY)

180-T. HSS, Plus High Angles, Mills Like Carbide. Walden F. Sinawski. *American Machinist*, v. 94, Apr. 3, 1950, p. 122-123.

Claims that the advance of carbides has been so rapid that full possibilities of high speed steel have not been realized. Recent experiments reported show that "impossible" speeds can be attained with reground scrap cutters. (T6, G17, TS)

181-T. Cutting Tool Materials. *Steel*, v. 126, Apr. 3, 1950, p. 98-101.

Lower machining costs are achieved by first checking relative efficiencies of high speed steels, cast alloys and carbides in the laboratory. Cast types show up well but must be chosen carefully. "Cast alloy" resembles steel in appearance but contains Fe only as an impurity. It cannot be forged, heat treated, or machined, except by grinding. It is principally a mixture of Cr, W, and Co, with minor percentages of C, V, Mn, Ta, or Fe. It withstands temperatures up to 1600° F. Standard tip designs and comparative performance data. (T5, G17, SG-j)

182-T. The Big Show's Still Colossal! *Steel Horizons*, v. 12, Spring 1950, p. 3-5.

Applications of stainless steel in the circus. (T10, SS)

183-T. Mr. Winter Cries "Uncle!" *Steel Horizons*, v. 12, Spring 1950, p. 6-7.

Production of stainless-steel storm windows. Piercing, forming, and projection welding. (T26, G1, K3, SS)

184-T. What Are 4,500,000 Miles to a Stainless Steel Train? *Steel Horizons*, v. 12, Spring 1950, p. 8-9, 22.

Good condition of Burlington's "Zephyrs" after 12 years of service.
(T23, SS)

185-T. Fasteners: Mighty Mites of Industry. *Steel Horizons*, v. 12, Spring 1950, p. 10-11.

Cold heading, forming, and applications of stainless-steel screws and bolts. (T7, G10, SS)

186-T. Crafty Tricks With Stainless. *Steel Horizons*, v. 12, Spring 1950, p. 16-17.

Stainless steel accessories for hotels, bars, soda fountains, and restaurants. (T29, SS)

187-T. Briefs on the Horizon. *Steel Horizons*, v. 12, Spring 1950, p. 20-21.

Miscellaneous applications of stainless steel and special alloy steels.
(T general, SS, AY)

188-T. Over the Horizon in a Stainless Steel Laboratory. *Steel Horizons*, v. 12, Spring 1950, p. 23-25.

Proposed standardized stainless-steel laboratory units which can be arranged to suit needs of users.
(T26, T10, SS)

189-T. Twenty-Three Aluminum Sleepers. *Railway Mechanical and*

Electrical Engineer, v. 124, Apr. 1950, p. 188-191.

Constructional features. (T23, Al)

190-T. Galvanized Bridge Wire: Basic Unit of Americanized Prestressed Concrete Design. Blair Birdsall. *Steel,* v. 126, Apr. 10, 1950, p. 100, 115, 118.

How cold-drawn steel wire for prestressing of concrete is made by John A. Roebling's Sons Co. Contrasts American and European practice. Mechanical properties tabulated. (T26, Q general, CN)

191-T. Carbide Die Developments. George Eglinton. *Tool Engineer,* v. 24, Apr. 1950, p. C8-C12.

Design factors, including the need for redesign from that used for steel dies to obtain the most satisfactory results. Typical dies, and cost savings for one example. (T5, C)

192-T. Die Castings Give Lift To Realistic Toy Truck. *Die Castings,* v. 8, Apr. 1950, p. 19, 59-62.

Application of Al and Zn die castings. (T10, Al, Zn)

193-T. Use of Several Alloys Gives Special Properties. *Die Castings,* v. 8, Apr. 1950, p. 20-22, 55.

Uses of brass, Zn, and Al die castings in gas meters and other instruments. (T8, Al, Cu, Zn)

194-T. Deep Drawn or Die Cast? *Die Castings,* v. 8, Apr. 1950, p. 23-24, 27, 55-56.

Advantages of Zn-alloy die castings for auto-heater housings. (T10, Al)

195-T. For Scale Models: Fine Detail; Low Tool Cost; Easy Finishing. *Die Castings,* v. 8, Apr. 1950, p. 28-29, 62-63.

Use of Pb die castings for small-scale industrial, commercial, and military models, and hobbies. (T10, Pb)

196-T. New Design for Electric Conduit Fittings. *Die Castings,* v. 8, Apr. 1950, p. 32-34, 56-58.

Use of special Al-alloy die castings. Advantages over cast-iron or machined products. (T1, Al)

197-T. Using Ceramic Coating for Specialized Applications. Walter Rudolph. *Finish,* v. 7, Apr. 1950, p. 19-21.

High-temperature ceramic coatings prove useful for applications varying from pump cylinders to components for B-36 bombers and jet engines. (T24, T25, L27)

198-T. Precision Porcelain. R. A. Weaver, Jr. *Finish,* v. 7, Apr. 1950, p. 42-44.

Otis Elevator Co. experiments successfully with a porcelain-enamel escalator step riser. (T26, L27)

199-T. Bronze Glass Molds Replacing Cast Iron Glass Molds. Vladimir A. Grodsky. *Journal of the Optical Society of America,* v. 40, Mar. 1950, p. 177.

An Al bronze containing Cu, Al, Fe, Mn, and Ni is used at the U. S. Naval Gun Factory, Washington, for molds for optical glass. It can easily be cast, forged, machined, polished and welded. It has good corrosion resistance, and a heat conductivity considerably higher than that of iron; also when heated, it acquires a self-healing protective oxide coating. (T29, Cu)

200-T. Development in the Use of Steel for Underground Support. F. J. Haller. *Mining Engineering; Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 187, Apr. 1950, p. 475-478.

Experience over the past six years, involving more than five miles of permanent underground mine openings, has proved that steel is permanent, safer and, in the long run, cheaper than either treated or untreated wood supports. (T28, CN)

201-T. Corrosion Resistant Materials and Coatings in Trail Chemical Operations. E. A. G. Colls. *Mining Engineering; Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 187, Apr. 1950, p. 491-494.

Corrosion in above plants producing ammonia, sulfuric, nitric and phosphoric acids, ammonium phosphates, sulfate and nitrate, together with miscellaneous allied material problems and their solution using erosion or corrosion-proof materials. (T29, R6, SG-g)

202-T. Use of Tantalum Mesh to Repair a Large Surgical Defect in the Anterior Abdominal Wall. R. A. Bussabarger, M. L. Dumouchel, and William H. Ivy. *Journal of the American Medical Association,* v. 142, Apr. 1, 1950, p. 984-985. (T10, Ta)

203-T. Metallurgical Materials in the Coal-Mining Industry. C. S. Thomas. *Quarterly of the Colorado School of Mines,* v. 45, June 1950, p. 39-60.

Varied applications; properties and uses of the different alloys. (T28)

204-T. Noble Metal Catalysts; All-Round Efficiency of Rhodium-Platinum Alloys. *Chemical Age,* v. 62, Mar. 18, 1950, p. 404, 406.

Production and use in mesh form. Alloys contain up to 10% Rh. (T29, Pt)

205-T. Alloy Steels for Plastic Moulds and Hobs. L. Sanderson. *Metallurgia,* v. 41, Mar. 1950, p. 248-250. (T5, AY, TS)

206-T. Aluminium Alloys for Mine-Shaft Equipment. New Cages at Gresford Colliery. *Metallurgia,* v. 41, Mar. 1950, p. 268-269. (T28, Al)

207-T. Steels for Specialized Applications. J. M. Mowat. *Engineering,* v. 168, Mar. 24, 1950, p. 338-339. A condensation.

Effects of alloy steel refining, forging, and heat treatment procedures on properties of forgings. Procedure of British firm in production of steam-turbine rotors. (T25, D general, F22, J general, AY)

208-T. Packaging and Bottling Show. (In French.) Pierre Prévot. *Revue de l'Aluminium,* v. 27, Jan. 1950, p. 25-33.

Numerous applications of Al included among the exhibits. (T general, Al)

209-T. Nickel-Clad Steel in the Beet Sugar Industry. *Nickel Bulletin,* v. 23, Feb. 1950, p. 26. (T29, Ni, CN)

210-T. Metal Problems in the Container Field—and Amplifying Statements. Neil M. Waterbury and F. George Pasotti. *Ceramic Industry,* v. 54, Apr. 1950, p. 112-113, 115, 172.

Properties and applications of miscellaneous metals and alloys in glass-container production. (T29)

211-T. Special Burner Converts Gas Furnace for Oil. G. J. Gollin. *Iron Age,* v. 165, Apr. 13, 1950, p. 89-92.

British-designed Y-type burner which permits combustion of fuel oil in furnaces originally designed for natural gas. Design considerations were combustion characteristics, furnace space requirements, flame sizes, burner-clogging clearances, and fuel-feed turn-down ranges. Miscellaneous industrial applications. (T5, J general)

212-T. Ethylene Production by Cracking of Propane-Ethane Mixtures. Part 2. Tube Selection and Inspection. C. K. Buell and L. J. Weber. *Petroleum Processing,* v. 5, Apr. 1950, p. 387-391.

Erosion of tube metal by hard carbon particles constitutes the greatest mechanical problem in the operation of these cracking furnaces. As a result of extensive plant tests, 18-8 Cr-Ni alloy tubes were selected for positions near the outlet of the cracking coil, while 25-20 Cr-Ni tubes are used where service is less severe. The welded-coil type of construction has proved entirely feasible. (T29, Q9, SS)

213-T. Don't Gamble in Selecting Tool Steels. Hugo Becker. *American Machinist,* v. 94, Apr. 17, 1950, p. 102-105.

Recommended applications of 22 standard toolsteels for metal cutting, hot and cold forming, die casting, plastic molding, and hand tools. (T5, T6, G general, E13, TS)

214-T. Aluminum Plant Is Built of Aluminum. *Factory Management and Maintenance,* v. 108, Apr. 1950, p. B90-B92.

Picture story of a plant built by the Aluminum Co. of America. Advantages over other materials. (T26, Al)

215-T. Welded Frame Construction Cuts Building Costs. *Factory Management and Maintenance,* v. 108, Apr. 1950, p. B96-B97.

Application at Perkins Products Co., Chicago. (T26, K general, CN)

216-T. Engineer's Forum on Diesel Piston-Ring and Cylinder Wear. *SAE Journal,* v. 58, Apr. 1950, p. 34-38; discussion, p. 38-41. Based on "Piston Ring Design and Application and Their Effect on Wear", by A. M. Brenneke.

Effects of coolant temperature, of cylinder-liner microstructure, of fuel and lubricant composition, of material used in rings (gray cast iron, alloyed iron, Cr-plated iron) and of ring design. D. A. Paull and Stuart Nixon, M. R. Bennett, W. J. Pelizzoni, Paul S. Lane, Ralph L. Boyer, H. C. Braendel, A. W. Pope, Jr., L. D. Thompson, and D. J. Cummins contribute to the discussion. (Q9, T21, CI)

217-T. Aluminum Does Steel's Job in Airplane Engine Mounting. *SAE Journal,* v. 58, Apr. 1950, p. 42-45. Excerpts from "Fatigue Life of Aircraft Engine Mounting Components", by R. C. Henshaw, L. Wallerstein, Jr., and S. J. Zand.

By substituting Al forgings for steel, a weight saving of 250 lb. on a 4-engine airplane was achieved. Applying results from test work and certain design principles made it possible to get superior endurance life from these highly-stressed Al-alloy aircraft components. (T24, Q7, Al)

218-T. Magnetic Materials. A. Boggs. *Western Union Technical Review,* v. 4, Apr. 1950, p. 79-85.

Theory of magnetism, properties of the various magnetic materials, and their applications in electricity and electronics. (T1, P16, SG-n, p)

219-T. Carbide Insert Bit Drilling at the Cleveland-Cliffs Iron Co. Mines, Ishpeming, Mich. Walter E. Lewis. *U. S. Bureau of Mines,* Information Circular 7558, Mar. 1950, 16 pages.

Tests and results of comparing performance of WC insert bits and steel detachable bits. Includes tables and photographs of results. (T28, C, TS)

220-T. The Use of Metal Powders in Engineering. H. W. Greenwood. *Machinery* (London), v. 76, Mar. 23, 1950, p. 419-421.

A survey, excluding powder metallurgy. Covers brazing powders, powdered solders, thermit welding, filtration elements, "powder welding", metallizing, the magnetic clutch, and Al powder in "Aerocrete"—a porous, light-weight material having good thermal and sound insulating properties. (T general)

221-T. Anodes. (In German.) Edmund R. Thews. *Metalloberfläche,* sec. B, v. 2, Feb. 1950, p. 25-28; Mar. 1950, p. 40-43.

The most important properties of anodes and the factors which indi-

rectly affect their efficiency and life. The decomposition products deposited on anodes often have a favorable effect on the reaction. Anode materials and methods of fabrication. Choice of Cu anodes for given electrodes, as affected by methods of production. Effects of anodic and cathodic polarization. (T5, C23, L17)

222-T. Eccentricity of Pressure-Coated Electrodes. (In German.) Paul Wimmer. *Schweisstechnik*, v. 4, Feb. 1950, p. 13-18.

Causes of eccentricity in the production of coated electrodes by various methods. Proposes that the flow of the coating material be controlled so as to be in the direction of the core axis, in order to prevent occasional pressure variation from bending the core wire. (T5, K1)

V

MATERIALS
General Coverage of Specific Materials

78-V. Castings in Nickel-Molybdenum and Nickel-Molybdenum-Chromium Alloys. W. H. Richardson. *Nickel Bulletin*, v. 23, Jan. 1950, p. 2-4.

Physical and mechanical properties and corrosion resistance of two high-Ni (56 and 63%) alloys. (P general, Q general, R general, Ni, SG-g)

79-V. Properties of Copper-Base Casting Alloys. *Foundry*, v. 78, Apr. 1950, p. 135-136.

Melting practice, physical and mechanical properties, workability and machinability, applications, etc. (Cu)

80-V. Phosnic Bronze—A New Copper-Base Alloy. Donald K. Crampton. *Wire and Wire Products*, v. 25, Mar. 1950, p. 228-230, 242-243.

Relatively new alloy developed by Chase Brass & Copper Co. Undisclosed percentages of Ni and P combine to form Ni phosphide which dissolves in Cu at high temperatures. On quenching and reheating, the Ni phosphide separates in extremely fine particles resulting in increased tensile strength, hardness, and stiffness. Electrical conductivity is about 60% of that of pure Cu. Comparative mechanical and physical properties. Applications are suggested. (Q general, P general, Cu)

81-V. New Cobalt-Base Alloy for High-Temperature Sheet. W. O. Binder and H. R. Spendelow, Jr. *Metal Progress*, v. 57, Mar. 1950, p. 321-326.

Superior high-alloy sheet, for use at temperatures up to 1800° F., based on Co (50%), Cr, Ni, and W. While strong and stiff, it can be readily formed in bending, stamping, and drawing; has good weldability; and high resistance to oxidation. Optimum properties are developed by brief heating at 2200° F., followed by air cooling. (Co, SG-h)

82-V. Non-Heat-Treatable Wrought Aluminum Alloys. *Materials & Methods*, v. 31, Mar. 1950, p. 83.

Data sheet covers compositions; physical properties; mechanical properties; annealing temperature; hot-working temperature range; machinability; relative torch, inert-arc, and resistance weldability; resistance to atmospheric and chemical corrosion; available forms; and uses of 2S, 3S, 4S, 52S, and 56S alloys. (Al)

83-V. Thallium. Properties, Sources, Recovery, and Uses of the Element and Its Compounds. William H. Waggaman, Gladys G. Heffner, and Edwin A. Gee. *U. S. Bureau of Mines*, Information Circular 7553, Mar. 1950, 50 pages.

Mechanical, physical, and chemical properties. Analysis procedures. 369 ref. (Tl)

84-V. Nodular Cast Iron. G. Vennerholm, H. Bogart, and R. Melmoth. *Foundry Trade Journal*, v. 88, Mar. 9, 1950, p. 247-256.

Evaluation of the present state of development. Methods of manufacture, effect of composition on physical properties, and economic factors involved. A range of potential applications. (CI)

85-V. Nodular Graphite Cast Iron. Charles K. Donoho. *Product Engineering*, v. 21, Apr. 1950, p. 140-144.

Production, microstructures, mechanical properties, heat treatment, machinability, and applications. (CI)

86-V. And Now—Titanium Tubing. A. M. Bounds. *Iron Age*, v. 165, Apr. 6, 1950, p. 85-89.

Production using inert-atmosphere welding and annealing. Metallographic technique and weld microstructures. Mechanical properties and applications. (Ti)

87-V. Chambersburg Engineering Develops New Ductile Cast Iron. *Steel*, v. 126, Apr. 10, 1950, p. 86.

Mg added to a high-carbon cast iron transforms the graphite from the normal flake form to spheroidal form, resulting in high tensile strength and a substantial amount of ductility. Material retains self-lubricating properties and much of the vibration-dampening properties of flake-graphite cast iron. (Q23, CI)

88-V. A Preliminary Survey of Zirconium Alloys. C. T. Anderson, E. T. Hayes, A. H. Roberson, and W. J. Kroll. *U. S. Bureau of Mines*, Report of Investigations 4658, Mar. 1950, 48 pages.

Investigation to determine suitability for high-temperature applications. Preliminary study of 25 alloy systems with respect to preparation, fabrication, tensile properties, metallographic structures, constitution, and heat resistance. (Zr, SG-h)

89-V. Meehanite Nodular Iron Castings. V. I. Laverty. *Canadian Metals*, v. 13, Mar. 1950, p. 30-31.

Nodular irons produced by Meehanite foundries reveal characteristic properties produced by this process. Some examples of castings in this new metal. Tensile and hardness values are tabulated. (Q27, Q29, CI)

90-V. Some Heat-Treatable Copper-Rich Alloys. P. Mabb. *Metallurgia*, v. 41, Mar. 1950, p. 242-247.

A few of the more important types, including Al bronze, Be copper, Cr copper, and others. Phases and transformations, effects of alloying elements, heat treatments, pickling, mechanical properties, and fabrication. (Cu)

91-V. Commercial Production of Malleable Titanium and Zirconium. (In French.) W. J. Kroll. *Revue de Métallurgie*, v. 47, Jan. 1950, p. 1-18.

Methods of recovery. Physicochemical properties of the metal produced depending on the method of production. Present applications of the metals and future possibilities. 58 ref. (Ti, Zr)

92-V. German Ferrous Metal Industry. *Metal Progress*, v. 57, Apr. 1950, p. 508, 510, 512, 514, 516, 518, 520, 526, 528, 530, 534, 536, 538, 542, 544, 546, 548, 550. Abstracted from "The Ferrous Metal Industry in Germany During the Period 1939-1945", George Patchin and Ernest Brewin, *British Intelligence Objectives Subcommittee*, Overall Report No. 15.

Raw materials and their beneficiation, blast furnaces and their operation, ferro-alloys, steel production, and mechanical working (Simon Feigenbaum), foundry practice (C. K. Donoho), welding (W. L. Warner), and coatings (Adolph Bregman). (Fe)

93-V. The New Metals—Molybdenum, Titanium and Zirconium. *Welding Journal*, v. 29, Apr. 1950, p. 321-322; *Industrial Gas*, v. 27, Apr. 1950, p. 16.

Physical and mechanical properties, corrosion resistance, weldability, etc. (Mo, Ti, Zr)

94-V. Tungsten. E. L Reed. *U. S. Atomic Energy Commission, AECD-2700*, Sept. 15, 1947, 107 pages.

Properties; fabrication; preparation; analysis; equilibrium studies with other elements and compounds; structural studies and changes in properties under exposure to radiation; and nuclear data. 110 ref.

95-V. High Conductivity Copper: The Froghall Works of Thomas Bolton & Sons, Ltd. W. E. Alkins. *Metal Industry*, v. 76, Mar. 24, 1950, p. 223-227; Mar. 31, 1950, p. 243-246.

Equipment and procedures, including refining, casting, wire drawing, annealing and pickling, and rolling. Final installment: Manufacture of rectangular, commutator, and strip copper. Other products of the company. (Ti, SG-r, Cu)

96-V. Thermostatic Bimetals. (In French and German.) H. Bovet. *Pro-Metal*, v. 2, Dec. 1949, p. 511-520.

Principles, uses, production, and testing. (SG-s)

97-V. Titanium in Industry. (In German.) H. O. Nicolaus. *Zeitschrift des Vereines Deutscher Ingenieure*, v. 92, Mar. 1, 1950, p. 153-160.

Reviews literature on the mining, ore dressing, and smelting of titanium ore; on the production of pure Ti and its properties; and on the alloying of Ti with other metals. 75 ref. (Ti)

98-V. (Book) Les Aciers Fins et Speciaux Français. (French Fine and Special Steels.) 300+ pages. 1949. S.P.A.S., 12 rue de Madrid, Paris, France. 770 fr.

A handbook prepared by the French Fine and Special Steel Producers' Assn. Essential information concerning these steels and their methods of production. (D general, ST)

99-V. (Book) Rarer Metals. Jack de Ment, H. C. Dake, E. R. Roberts, and R. Campbell Williams. 345 pages. 1949. Temple Press, Ltd., London. 25s.

The mineralogy, chemistry, physics, and technology of some of our less familiar metals — a compilation of basic data. The metals covered are: beryllium, gallium, indium, thallium, germanium, titanium, zirconium, hafnium, thorium, vanadium, columbium, tantalum, molybdenum, tungsten, uranium, selenium, tellurium, platinum, palladium, rhodium, iridium, osmium, ruthenium, lithium, rubidium, cesium, calcium, barium, rhenium, and boron. Chief difference between this English edition and its American counterpart is the addition of material on the rarer alkali metals, the alkaline-earth metals, boron, and rhenium. (EG-a, b, c, d, e, h, j)

EMPLOYMENT SERVICE BUREAU

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POSITIONS OPEN

East

METALLURGICAL ASSISTANT: For development and control work in precious metals and nonferrous metals. Must have imagination, resourcefulness and mechanical ability. Splendid opportunity for advancement in small progressive organization. Location New York City. Both recent graduates and those with specialized experience will be considered. State full qualifications and starting salary. Box 5-5.

SALES DEVELOPMENT ENGINEER: New York-New England territory. Recent metallurgical engineering graduate preferred, or someone who has been working in the metals industry for several years. Training period of six months in plant, including sales training. Manufacturer of stainless steels and nickel-base alloys in the form of wire, rod and strip. Excellent opportunity for candidate selected to advance rapidly to a responsible position. Box 5-10.

CIVIL SERVICE: Chemist, metallurgist, physicist in and near Washington, D.C. Rating depends on professional qualifications. U.S. Civil Service Commission, Washington 25, D.C.

Midwest

TUBING SALESMAN: Man with engineering training and field sales experience desired by manufacturer of seamless and welded carbon, alloy and stainless steel tubing. Applications will be treated confidentially. Box 5-15.

STAINLESS STEEL SALESMAN: For sales development work with national warehouse distributor of stainless steels. Some sales experience necessary. Metallurgical training desirable. Age under 28 preferred. Unusual opportunity for aggressive young man. Box 5-140.

POSITIONS WANTED

SALES ENGINEER: Age 40, married, two children. Twenty years experience, 10 years in sales, 10 years in industry including production, process development, trouble shooting, physical testing of ferrous and nonferrous metals. Desires position in sales engineering with progressive company. Will relocate. Box 5-20.

METALLURGIST: Sales and development engineering. B.S. and graduate credit. Age 36, married. Nine years experience in research, process engineering, powdered metals and metallic pigments. Location unimportant. Minimum salary $6000 with advancement possibilities. Box 5-25.

WELDING ENGINEER: College trained. Age 35. Twelve years of diversified experience in all phases of welding, brazing and soldering. Metallurgical welding research, engineering and processing experience is extensive. Desires position in executive capacity as works manager or reporting to general manager of a small fabricating plant that desires high-quality production work. Box 5-30.

DISTRICT SALES MANAGER. Or sales engineering or product development leading to sales managership. B.S. in metallurgical engineering and M.A. in business administration. Wide experience in development and sales engineering suitable for company in steel or related industry. Box 5-35.

ORDNANCE ENGINEER: B. Met. Eng., age 30, family. U.S. Government employee. Experience in designing, conducting, analyzing and reporting tests on experimental armor plate and projectiles in regard to ballistic and metallurgical properties. Knowledge of statistics. Desires position with manufacturer or testing agency of modern ordnance materials. Box 5-40.

METALLURGIST: With 35 years experience in construction of high-temperature, high-pressure equipment for chemical, gas, petroleum industries. For last 12 years chief metallurgist of eastern chemical equipment firm. Box 5-45.

METALLURGIST: Nonferrous. Age 46, Ph.D. in metallurgy. Four years college teaching, 16 years experience in industrial research and plant metallurgy, light alloys, titanium, zirconium and copper-base alloys. Author of more than 40 papers in these fields. Desires position as department head, teaching or metallurgical research. Box 5-50.

METALLURGIST: B.S. in Met. Eng. Age 25. Three years varied experience in metallography, physical testing, and materials control; ferrous and nonferrous. One year recent graduate study. Laboratory research or materials control position desired. Eastern location preferred. Box 5-55.

METALLURGIST: Married, two children. Diversified experience in chemical analysis, physical testing, heat treating, metallography, radiography, ore dressing, smelting and refining of precious metals, ferro-alloy production, development and control. Progressive, capable supervisor. Proven ability at cost reduction and increasing production. Now employed, salary open, will locate anywhere. Box 5-60.

METALLURGICAL ENGINEER: Graduate Carnegie Institute of Technology, 1948. Veteran, married, no children. Two years diversified experience in basic openhearth production control, customer complaint investigations and heat treating. Desires position as development or sales engineer. Willing to enter training course that offers opportunity. Prefers Chicago area. Box 5-65.

METALLURGIST OR SALES ENGINEER: Recent graduate, married, veteran, one child, age 26. Interested in position in either sales field or metallurgy. Box 5-70.

METALLURGICAL ENGINEER: B.S. in Met. Eng., 1944. Age 28, married. Desires position in metallurgical sales or contact work; especially interested in employment with a steel company or commercial heat treating shop. Background as production metallurgist for a large manufacturer of agricultural and industrial machinery. Salary open. Box 5-75.

METALLURGICAL ENGINEER: B.S. in Met. Eng. Married, one child. Industrial background includes over eight years design and production of welded structures. Desires position that will utilize both metallurgical training and industrial background. Box 5-80.

METALLURGICAL ENGINEER: Master's degree. Single, age 32, veteran. Five years experience in heat treating, metallography, physical testing of ferrous materials. Seeking sales, teaching, research or production in Southwest or South. Box 5-85.

METALLURGICAL ENGINEER: B.S., M.S. Foundry study published. One year in heat treating and machine shop. One year refinery metallurgist dealing with ferrous, nonferrous metals, high-temperature problems, corrosion, welding, testing methods. Age 26, married. Desires position in metallurgical capacity with opportunity for advancement to production management. Box 5-90.

METALLURGIST: B.S., M.S. in metallurgy. Age 31, married. Six years experience in nonferrous research and development. Employed at present. Desires position with responsibility and future in Cleveland area. Box 5-95.

METALLURGIST: Will receive B.S. in metallurgy from Notre Dame in June. Has four years industrial experience acquired before entering school and during summer. Experience includes chemical analysis and physical testing at elevated temperatures. Married, age 27, veteran. Location immaterial. Box 5-100.

METALLURGICAL ENGINEER: B.S. from University of Kentucky in June 1950. Age 24, married, veteran. Desires employment in field of production metallurgy or of welding. Will locate anywhere. Box 5-105.

WELDING ENGINEER: B.S. in Met. Eng. Ten years experience in welding applications and quality control in manual, automatic and specialty welding of mild and stainless steels. Supervised development projects and service engineering involving welding electrodes, heat treatment, and machining of ferrous and nonferrous materials. Author of articles, specification manuals. Talks to technical societies. Interested in service-sales engineering or fabrication development-control. Box 5-110.

METALLURGIST: B.S. in Met. Eng. Twelve years varied experience with large steel company in inspection, testing, investigation, metallurgical laboratory supervision. Five years assistant professor with large college. Desires permanent location in industry. Investigation or customer contact preferred, but would consider organization and operation of new metallurgical department with small plant. Box 5-115.

MECHANICAL ENGINEERING STUDENT: Massachusetts Institute of Technology, class of 1951. Desires summer position to supplement school work and to use technical knowledge. Available after June 2. Will travel. Box 5-120.

VIGOROUS MAN OF 59: Experienced technical advisor and consultant; administrator and businessman; coordinator of extensive research programs. Familiar with patents and licensing. Thirty years experience with commercial metals including production and manufacture; industrial and management work; technical sales and sales development. Box 5-125.

METALLURGICAL ENGINEER: B.S. in Met. Eng., August 1948. Married, one child. One year's experience in control laboratory. Presently engaged in work toward Master's degree; research problem dealing with ferrous heat treating. Interested in all phases of heat treatment. Desires position with company engaged in alloy steel production. Location immaterial. Box 5-130.

METALLURGIST: B.S. in Met. Eng., 1949. Some graduate work. Two years experience in plant heat treating, testing and trouble shooting on alloy steels; ½ year as assistant metallurgist in nonferrous research. Desires position in research and development work training program or sales, ferrous or nonferrous. Location immaterial. Box 5-135.

See Details on Page 4